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The effect of sex, carcass mass, back fat thickness and lean meat content on pork ham and loin characteristics

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Abstract. This study was designed to determine the ratio of ham and loin in half-carcasses and the tissue composition of these cuts. The research material consisted of 140 pig carcasses. The experimental materials were derived from the Polish commercial population of fattener pigs. Genetic material representing the most commonly slaughtered fatteners in Poland. Fatteners for the study came from several suppliers. All fatteners were kept in similar farms complying with principles of animal welfare. The right half-carcasses were divided into different groups, regardless of sex, half-carcass mass, back fat thickness and lean meat content class. Ham and loin obtained from carcasses were subjected to a detailed dissection, and the percentage of ham and loin in the carcass and the overall percentage of of the cuts in relation to the entire half-carcass were calculated. Gilts were characterized by a higher content of ham in half-carcasses than barrows ($P \leq 0.01$). The increase in back fat thickness reduced the content of ham in half-carcasses and increased the content of loin ($P \leq 0.01$). A similar trend was shown for the lean meat content class parameter. Additionally, interaction ($P \leq 0.01$) between back fat thickness and meat content with respect to the percentage content of loin in carcasses was noted. Gilts were characterised by about a 1.38 % higher proportion of muscles in the ham ($P \leq 0.05$) and a 0.47 % lower proportion of intermuscular fat ($P \leq 0.01$). An average increase of five point in back fat thickness increases the amount of subcutaneous fat with skin ($P \leq 0.01$) and intermuscular fat ($P \leq 0.01$) and reduces muscle ($P \leq 0.01$) and bone ($P \leq 0.05$ and $P \leq 0.01$) levels. The interaction of percentage content of muscles in ham was observed ($P = 0.04$). The meat content class of carcasses did not only affect the level of bones in ham. It was confirmed that sex affected all the analysed dissection elements of the loin. Back fat thickness and meat content classes were present in almost identical amounts in loin tissues ($P \leq 0.05$ and $P \leq 0.01$). Half-carcass mass showed a strong negative correlation with bone content in ham and loin ($r = -0.35$ and $r = -0.21$, respectively). Back fat thickness and meat content strongly and inversely correlated with the content of ham and loin in half-carcasses ($r = -0.41$ and $r = 0.59$ for back fat thickness; $r = 0.66$ and $r = -0.57$ for lean meat content). Close and inverse correlations of back fat thickness and lean meat content were observed with regard to their content in ham and loin ($P \leq 0.01$).

1 Introduction

Pork is still dominant in world meat consumption and accounts for over 37 % of all consumed meat (McGlone, 2013). Poland is one of the leading EU countries in terms of pig production and plays an important role in the pork market, slaughtering about 17 million fatteners per year (European Commission prospect, 2012). In Europe, pork is most commonly sold in fresh or chilled form, and the most popular cuts are ham and loin (Verbeke et al., 2010). The popularity of these elements is affected by a few features. Ham and loin represent more than 35 % of total slaughter carcass mass and therefore undoubtedly account for the highest percentage of all cuts. These two parts are also characterised by a high proportion of lean meat (Winiarski et al., 2004).

The optimization of pork production systems requires knowledge of the sources of the classification of the raw material (Marcoux et al., 2007) because the mass, content of carcass elements and its construction may be mutually dependent (Mérour and Hermesch, 2008). The technological value of primal cuts determines their further use, so the search for new factors, measurements and parameters affecting the use of the carcass for further processing has practical repercussions and is necessary (Lisiak et al., 2015). The study of the relations between the basic measurements of the pig carcass and the study of its processing capacity are two leading topics of current research (Pulkrábek et al., 2006).

Carcass assessment in terms of lean meat content and cuts serves both to evaluate production system efficiency and, on the other hand, to predict processing potential. The greatest possible amount of information acquired at the earliest stage of slaughter or directly before it is essential for pork processors. Such information enables the rapid segregation of raw materials to the sales markets. Slaughtering, cutting and sales destination are connected with the size and tissue composition of given primal cuts; these processes should go hand in hand with maximizing meat processor revenues (Buhr, 2004).

The economic value of selected cuts from the carcass (mainly ham and loin) depends on the demand for the final products derived from them, which are most often sold in unprocessed form (Knecht et al., 2011, 2012; Chmielowiec-Korzeniowska et al., 2012). The demand for leaner pork parts is increasing, not only in European countries. Increasing numbers of new technologies are being developed to determine the value of ham and loin (van Wijk et al., 2005). The fastest parameters to measure during slaughter are sex, half-carcass mass, back fat thickness and lean meat content. Our earlier study showed that the parameters mentioned had a great impact on the pork belly (Duziński et al., 2015). Therefore, it is reasonable to conduct research based on key factors that may give information about the processing value of the carcass, taking into account the most valuable cuts, especially ham and loin.

Based on the above problems, the aim of this study was to determine the proportions of ham and loin in half-carcasses and to determine their tissue composition based on sex, half-carcass mass, back fat thickness and lean meat content classes.

2 Materials and methods

The experimental materials were derived from the Polish commercial population of fattener pigs. The total research population consisted of 140 pig carcasses. Genetic material representing the most commonly slaughtered fatteners in Poland. Fatteners for the study came from several suppliers. All fatteners were kept in similar farms complying with principles of animal welfare in accordance with Ordinance of the Minister of Agriculture and Rural Development (2010). Pigs were transported in special vehicles from a distance not exceeding 150 km. The animals were slaughtered at a meat plant located in north–central Poland after a few hours' rest post delivery to the pig warehouse. The carcasses were bled and separated along the centre line, and the tongue, bristle, hooves, genital organs, perirenal fat, kidneys, diaphragm, eyes, middle ear, brain and spinal cord were removed. Only raw material with a post-mortem hot mass between 60 and 120 kg was classified for further studies.

After a 24 h cooling period, the right half-carcasses were divided into groups differentiated according to sex (gilts, barrows), half-carcass mass (< 42, 42–45, 45–48, > 48 kg), back fat thickness (< 22, 22–26, > 26 mm) and the lean meat content of carcass classes: S (> 60 % lean meat content), E (55–60 %), U (50–55 %), R (45–50 %). Back fat thickness was calculated as an average from five measurements on a carcass (over the shoulder at the thickest point; on the back; and at the beginning, centre, and end of the gluteus medius muscle). Lean meat content in carcasses was defined at the end of the slaughter line using a Capteur Gras/Maigre – Sydel (CGM) device. Ham and loin cut from all carcasses were subjected to a detailed dissection. Dissections were performed according to the European Union reference methodology (EC Regulation no. 1249/2008; Walstra and Merkus, 1996) by specially trained personnel. The detailed dissection of ham and loin separated the carcass into the following components: cut mass, skin with subcutaneous fat mass, muscle mass, bone mass, and intermuscular fat mass. A pair of approved electronic scales were used for weighing ham and loin, and dissected tissues, with an accuracy to the nearest 1 g. Additionally, the percentage of ham and loin in the carcass and the percentage of tissues in the cuts were calculated.

Numeric values were analysed statistically using the Statistica (2013, version 10, license no. JGNP410B482810AR-W) data analysis software. The values set out in the tables determine the arithmetic mean ($\overline{x}$) and standard deviation (SD). The application of the general linear model (GLM) was preferred because the collected data were checked for normality and homogeneity of variance. The normality distribution was examined by the Kolmogorov–Smirnov test, and all variables had p values above 0.1. The homogeneity of variance was tested by the Brown–Forsythe test, and there was no basis to reject the zero hypothesis regarding the homogeneity of variance. To indicate the significance of differences between means, Tukey's post-hoc test was applied. Pearson correlation coefficients were calculated to demonstrate the relationship between the factors analysed for the parameters tested. The main-effect statistical model was as follows and also included interactions:

$$x_{ijkl} = \mu + \alpha_i + \beta_j + \gamma_k + \delta_l + \varepsilon_{ijklm}, \quad (1)$$

where x_{ijkl} is value of the dependent variable, μ is the general average, α_i is the main effect of the ith sex ($i = 1$ (Gilts), 2 (Barrows)), β_j is the main effect of the jth half-carcass mass ($j = 1$ (< 42 kg), 2 (42–45 kg), 3 (45–48 kg), 4 (> 48 kg)), γ_k is the main effect of the kth back fat thickness ($k = 1$ (< 22 mm), 2 (22–26 mm), 3 (> 26 mm)), δ_l – the main

Table 1. The percentage content of ham and loin in half-carcasses according to factors tested.

Factor	Class	n	The percentage content in half-carcass (%)	
			Ham	Loin
Sex	Gilts	70	$24.59^{A} \pm 1.07$	19.84 ± 1.24
	Barrows	70	$24.17^{B} \pm 1.02$	20.16 ± 1.31
Half-carcass mass	< 42 kg	39	24.24 ± 1.15	19.78 ± 1.28
	42–45 kg	34	24.48 ± 1.08	19.93 ± 1.16
	45–48 kg	33	24.45 ± 0.99	20.09 ± 1.23
	> 48 kg	34	24.43 ± 1.03	20.32 ± 1.35
Back fat thickness	< 22 mm	48	$24.88^{A} \pm 1.13$	$19.22^{C} \pm 1.06$
	22–26 mm	44	$24.36^{B} \pm 0.81$	$19.95^{B} \pm 1.08$
	> 26 mm	48	$23.88^{C} \pm 0.88$	$20.87^{A} \pm 1.13$
Lean meat content	S	14	$25.94^{A} \pm 1.06$	$18.72^{C} \pm 0.89$
	E	57	$24.71^{B} \pm 0.81$	$19.65^{B} \pm 1.09$
	U	53	$24.11^{C} \pm 0.75$	$20.19^{B} \pm 1.06$
	R	16	$23.25^{D} \pm 0.66$	$21.22^{A} \pm 1.09$

A,B,C,D Different letters following values of the same factor denote statistically significant differences ($P \leq 0.01$).

effect of the lth lean meat content ($l = 1$ (S), 2 (E), 3 (U), 4 (R)), and ε_{ijklm} is the random experimental error normally distributed with zero mean and variance σ^2.

3 Results

The percentage content of ham and loin in half-carcasses according to sex, half-carcass mass, back fat thickness and lean meat content classes is presented in Table 1. Sex had a statistically significant ($P \leq 0.01$) effect on the content of ham in half-carcasses. Gilts were characterised by a higher content of ham in half-carcasses than barrows. However, a higher proportion of loin in half-carcasses was recorded for barrows, but this difference was not statistically proven ($P > 0.05$). An increase in half-carcass mass determined a proportional increase in the content of loin in half-carcasses. Differences between analysed groups were low and were not proven statistically ($P > 0.05$). The percentage of ham in half-carcasses changed disproportionately to the half-carcass mass; the lowest values were noted for the < 42 kg group and the highest for 42–45 kg. Analysis of the results showed that the back fat thickness affected the percentage content of ham and loin in half-carcasses. An inverse relationship was observed between the tested cuts. An increase in back fat thickness caused a decrease in the content of ham in half-carcasses for each group ($P \leq 0.01$). However, a proportional relationship was observed between the increase in back fat thickness and loin content for each group ($P \leq 0.01$). A similar trend was demonstrated for the lean meat content class parameter. With decreasing lean meat content classes the percentage of ham in half-carcasses decreased, while the proportion of loin increased ($P \leq 0.01$). The highest differences were noted between S and R and were 2.69 % for ham and 2.5 % for loin. There was also an observed interaction between back fat thickness and lean meat content class in terms of the proportion of loin in half-carcasses ($P \leq 0.01$).

The results of ham dissections according to sex, half-carcass mass, back fat thickness and lean meat content class are presented in Table 2. Sex affected the tissue composition, i.e. the proportions of muscle and intermuscular fat. Gilts were characterized by a 1.38 % higher proportion of muscle in the ham ($P \leq 0.05$) and a 0.47 % lower proportion of intermuscular fat ($P \leq 0.01$) than barrows. Half-carcass mass had no significant effect on the tissue composition of ham, and confirmed statistical differences were observed only for the percentage of bone between the extreme groups < 42 and > 48 kg ($P \leq 0.01$). Back fat thickness conditioned all the analysed tissue composition of ham. Average back fat thickness, when increased by five points, resulted in an increase in subcutaneous fat with skin content ($P \leq 0.01$) and intermuscular fat ($P \leq 0.01$ and $P > 0.05$) and a decrease in muscle content ($P \leq 0.01$) and bones ($P \leq 0.05$ and $P \leq 0.01$). The lean meat content class of carcasses only had no effect on the content of bones in ham. An increase in this level led to an increase in the muscle content of ham (about 12.52 %, $P \leq 0.01$) and a decrease in skin with subcutaneous fat ($P \leq 0.01$) and intermuscular fat (differences were statistically confirmed only between S, E, U, and R groups; $P \leq 0.01$).

Statistical analysis of the data showed an interaction between sex and lean meat content class with regard to the percentage content of muscles in ham with the percentage content of muscles in ham (Fig. 1). The interaction p value for the muscle parameter was $P = 0.04$.

Table 2. The percentage level of ham dissection tissues, according to factors tested.

Factor	Class	*n*	The level of dissection tissues (%)			
			Skin with subcutaneous fat	Muscles	Bones	Intermuscular fat
Sex	Gilts	70	18.38 ± 3.56	$69.49^{a} \pm 3.67$	8.18 ± 0.84	$3.85^{A} \pm 0.76$
	Barrows	70	19.53 ± 4.14	$68.11^{b} \pm 4.28$	7.95 ± 0.83	$4.32^{B} \pm 0.79$
Half-carcass mass	< 42 kg	39	18.94 ± 4.2	68.53 ± 4.44	$8.32^{B} \pm 0.87$	4.12 ± 0.91
	42–45 kg	34	18.75 ± 3.74	69.05 ± 3.91	7.99 ± 0.77	4.09 ± 0.75
	45–48 kg	33	18.37 ± 3.49	69.48 ± 3.87	8.04 ± 0.84	4.05 ± 0.73
	> 48 kg	34	19.95 ± 3.93	68.12 ± 3.81	$7.76^{A} \pm 0.81$	4.07 ± 0.85
Back fat thickness	< 22 mm	48	$16.00^{A} \pm 2.99$	$71.57^{A} \pm 3.14$	$8.43^{C,c} \pm 0.79$	$3.87^{A} \pm 0.68$
	22–26 mm	44	$18.88^{B} \pm 2.24$	$68.91^{B} \pm 2.48$	$8.06^{b} \pm 0.78$	4.06 ± 0.72
	> 26 mm	48	$22.17^{C} \pm 3.05$	$65.74^{C} \pm 3.92$	$7.67^{A,a} \pm 0.78$	$4.34^{B} \pm 0.95$
Lean meat content	S	14	$12.81^{A} \pm 1.54$	$75.11^{A} \pm 1.34$	8.00 ± 0.95	$3.94^{A} \pm 0.61$
	E	57	$16.79^{B} \pm 1.59$	$71.08^{B} \pm 1.46$	8.18 ± 0.83	$3.85^{A} \pm 0.75$
	U	53	$20.41^{C} \pm 1.73$	$67.33^{C} \pm 1.79$	8.08 ± 0.87	$4.11^{A} \pm 0.72$
	R	16	$24.82^{D} \pm 2.45$	$62.59^{D} \pm 2.65$	7.81 ± 0.72	$4.69^{B} \pm 0.76$

^{A,B,C,D} Different letters following values of the same factor denote statistically significant differences $P \leq 0.01$; ^{a,b,c} different letters following values of the same factor denote statistically significant differences $P \leq 0.05$

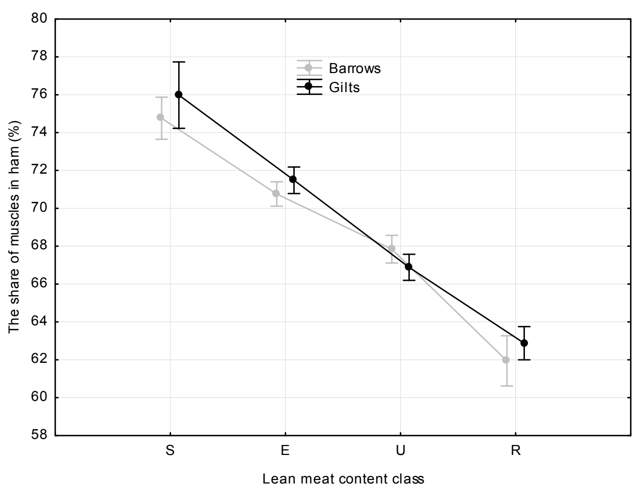

Figure 1. The percentage content of muscles in ham according to sex.

The tissue composition of dissected loins including sex, half-carcass mass, back fat thickness and lean meat content class is presented in Table 3. It has been shown that sex affected all the analysed dissection tissues. Loin collected from gilt carcasses had a higher content of muscles ($P \leq 0.01$) and bones ($P \leq 0.01$) and a lower level of intermuscular fat ($P \leq 0.01$) and skin with subcutaneous fat ($P \leq 0.05$) than that of gilts. Half-carcass mass did not affect loin tissue composition, in contrast to back fat thickness and lean meat content class. Increasing carcass fatness was reflected in an increasing content of skin with subcutaneous fat and in an undetermined growth of intermuscular fat ($P \leq 0.01$ and $P \leq 0.05$, respectively) and a decrease in muscle and bone content (both $P \leq 0.01$). The same trend observed in the case of back fat thickness was found for lean meat content classes; however, all differences between groups were proven at a statistically higher level ($P \leq 0.01$).

Correlations between the half-carcass mass, back fat thickness and lean meat content for the studied parameters are presented in Table 4. For the half-carcass mass only the confirmed correlations for the proportion of bone in ham ($P \leq 0.01$) and loin ($P \leq 0.05$) were observed. Back fat thickness and lean meat content are highly correlated with all tested parameters ($P \leq 0.01$), except for the level of bones in ham. However, the mathematical signs between identical parameters were the opposite of one another, and higher values were adopted for lean meat content.

4 Discussion

The problem of estimating the range and proportions of cuts in the carcass and tissue composition is still valid and not fully resolved. Our results indicate that the factors investigated shaped the percentage of ham and loin in the carcass and their tissue composition.

Studying the quality of the ham, Peloso et al. (2010) took into account the genotype, sex and slaughter weight as differentiating factors. It turned out that sex conditioned the size of the cut and its internal fat thickness, which is consistent with our results. Similar observations were made by Lattore et al. (2004), who demonstrated and statistically confirmed both a higher proportion of subcutaneous fat in ham for barrows and the content of ham in the gilt carcasses.

Table 3. The percentage content of loin dissection tissues, according to factors tested.

Factor	Class	n	The content of dissection tissues (%)			
			Skin with subcutaneous fat	Muscles	Bones	Intermuscular fat
Sex	Gilts	70	$27.95^{a} \pm 5.75$	$54.09^{A} \pm 5.73$	$10.36^{B} \pm 1.35$	$7.37^{A} \pm 1.77$
	Barrows	70	$30.01^{b} \pm 5.87$	$51.25^{B} \pm 6.05$	$9.69^{A} \pm 1.39$	$8.82^{B} \pm 1.89$
Half-carcass mass	< 42 kg	39	29.22 ± 6.47	52.14 ± 6.67	10.33 ± 1.42	8.05 ± 2.11
	42–45 kg	34	28.85 ± 5.25	52.99 ± 5.09	10.13 ± 1.31	7.81 ± 1.62
	45–48 kg	33	28.07 ± 5.44	53.54 ± 6.13	9.68 ± 1.34	8.55 ± 1.93
	> 48 kg	34	29.87 ± 6.21	52.09 ± 6.05	9.82 ± 1.58	7.99 ± 2.14
Back fat thickness	< 22 mm	48	$24.56^{A} \pm 4.42$	$56.86^{A} \pm 5.15$	$10.95^{C} \pm 1.32$	$7.41^{a} \pm 1.74$
	22–26 mm	44	$28.94^{B} \pm 3.43$	$52.87^{B} \pm 3.57$	$9.85^{B} \pm 1.17$	8.13 ± 1.61
	> 26 mm	48	$33.75^{C} \pm 5.38$	$47.99^{C} \pm 5.45$	$9.21^{A} \pm 1.12$	$8.79^{b} \pm 2.25$
Lean meat content	S	14	$19.61^{A} \pm 2.34$	$63.01^{A} \pm 3.24$	$10.94^{C} \pm 1.87$	$6.23^{A} \pm 1.43$
	E	57	$25.89^{B} \pm 2.21$	$57.89^{B} \pm 2.01$	$10.46^{B,C} \pm 1.3$	$7.54^{B} \pm 1.53$
	U	53	$31.12^{C} \pm 3.48$	$52.31^{C} \pm 2.69$	$9.85^{B} \pm 1.23$	$8.49^{B} \pm 1.99$
	R	16	$37.59^{D} \pm 3.29$	$47.65^{D} \pm 3.01$	$8.79^{A} \pm 1.88$	$9.73^{C} \pm 1.67$

[A,B,C,D] Different letters following values of the same factor denote statistically significant differences $P \leq 0.01$; [a,b] different letters following values of the same factor denote statistically significant differences $P \leq 0.05$.

Table 4. The Pearson's correlation between the half-carcass mass, back fat thickness and lean meat content for the studied parameters.

Item	Half-carcass mass	Back fat thickness	Lean meat content
Ham	0.09	-0.41^{**}	0.66^{**}
Loin	0.16	0.59^{**}	-0.57^{**}
The content in ham:			
Skin with subcutaneous fat	0.05	0.81^{**}	-0.94^{**}
Muscles	0.03	-0.74^{**}	0.96^{**}
Bones	-0.35^{**}	-0.44^{**}	0.09
Intermuscular fat	−0.04	0.28^{**}	-0.37^{**}
The content in loin:			
Skin with subcutaneous fat	0.02	0.78^{**}	-0.92^{**}
Muscles	0.04	-0.75^{**}	0.96^{**}
Bones	-0.21^{*}	-0.63^{**}	0.46^{**}
Intermuscular fat	−0.01	0.43^{**}	-0.54^{**}

* Correlation statistically significant, $P \leq 0.05$; ** correlation statistically significant, $P \leq 0.01$.

Half-carcass mass had no significant effect on any parameters. However, a lot of research has been conducted on carcass traits at different slaughter weights (Beattie et al., 1999; Latorre et al., 2004; Correa et al., 2006; Serrano et al., 2008), which confirms the influence of this factor. A shorter duration of organism growth determines the changes in the proportions of carcass tissue composition, especially the content of muscle (Lefaucheur et al., 1991; Skiba et al., 2012; Nuernberg et al., 2015). The explanation for these observations may be the overly small half-carcass mass variation within groups.

The effect of half-carcass mass on the tissue composition of the cut is ambiguous. Greater adiposity for ham at lower slaughter weights, for example, has been demonstrated (Peloso et al., 2010). On the other hand, a marked increase in gluteus medius muscle adiposity with increasing slaughter weight has also been observed. However, clear changes may be observed only in certain mass ranges, for example over 110 kg (Lattore et al., 2004). It has already been proved that an increase in half-carcass mass determines the increase in the mass of cuts (Unruh et al., 1996). Lattore et al. (2004) estimated that even if the mass of ham increases by about 1.6 kg, there will be an increase in slaughter weight of 10 kg. For the Polish population of finishers, Zybert et al. (2005) showed that an increase in hot slaughter weight of 5 kg caused a two-fold increase in the content of the total mass of meat in the carcass (about 1.6 kg). The optimization of half-carcass mass towards high muscle and low fat levels and in respect to the size of the cuts is a complex issue (Zybert et al., 2005).

Data concerning the percentage content of ham and loin according to the back fat thickness and lean meat content class are very interesting. A directly proportional relationship between the content of loin and back fat thickness and an inversely proportional relationship with the lean meat content class is often not noted. The above observations should be explained by the dissection and division of the cut characteristics. The loin as a dissection cut constitutes whole tissues, which include skin with subcutaneous fat, muscles, bones and intermuscular fat. The increasing total mass of the cut was affected by a higher increase in the proportion of skin with subcutaneous fat mass and intermuscular fat mass for higher back fat thickness, with a far smaller increase in longissimus dorsi muscle for a lower back fat thickness. On the other hand, ham is a primal cut in which muscles play a very great role (a component of the four main elements of further industrial cutting: thick flank, topside, silverside, hip muscle); thus, the total mass of ham is mainly determined by the muscles. The increase in fat thickness for ham therefore has no significant effect on the increase in the mass of the cut. Zybert et al. (2005) demonstrated that the degree of muscle affects the growth of the quantitative mass of meat and its content in the total half-carcass. Such a thesis is supported by the study conducted by Lawlor et al. (2013), who found negative correlations between the percentage content of ham and loin in pig carcasses. These authors indicated that an increase in one element determined the decrease in the second. Based on the above thesis, correlations observed in our study were additionally enhanced by negative correlation between cuts, hence the high contradictory results obtained for back fat thickness and lean meat content.

The consequence of increasing the content of meat in the carcass was the reduction in taste by reducing the content of fats (Nguyen et al., 2004). During dissection, two types of fat were separated: the first is the skin with subcutaneous fat, and the other is intermuscular fat. Subcutaneous fat is easy to trim off from the different parts of the carcass, which means that this is not a problem during the preparation of cuts for sale. More problematic is the intermuscular fat because it forms a stable connection between elements consisting of several muscles. Intermuscular fat content has a significant impact on consumer acceptance of products such as pork chops and ham slices (Kouba and Bonneau, 2009). Statistical analysis showed that sex, back fat thickness and lean meat content shape the level of this parameter. The correlations presented further indicated that intermuscular fat of the loin was more susceptible to change than ham.

The content of muscle in ham, confirmed by the interaction of lean meat content class and sex, may be explained by the higher deposition of fat for boars than gilts, which occurs for the purpose of more prolonged fattening (Freeden, 1980; Correa et al., 2008). Increases in muscle tissue during fattening are associated with the deposition of protein and fat in the body (Schnickel, 2001). The value of cuts in large part determines the meat and fat content. Our study confirmed that the back fat thickness and lean meat content classes are strongly linked, particularly in terms of the characteristics of ham and loin. The presentation of both back fat thickness and lean meat content classes aimed to answer whether it is possible to omit one of them without losing valuable information on the surveyed cuts. The similar results recorded and statistical differences suggest that such substitution is possible. The measurement of back fat thickness is more time consuming and requires a greater commitment. Lean meat content assessment is almost mandatory, so in our opinion such an approach to measurement, i.e. the omission of one content class, is justified without a loss of accuracy in the estimated parameter, given the fact that the two classes conform to one another. Confirmation of this inference may be found in a comparison of the results of the correlation of back fat thickness with lean meat content. Information on the overall lean meat content of the carcass is scarce. However, comparing this parameter with other factors, can give reliable data describing carcass processing capacity in relation to ham and loin.

5 Conclusions

The most important factors influencing the percentage and tissue composition of ham and loin were sex, back fat thickness and lean meat content class. Sex shaped the percentage of ham in the carcass and muscles and the tissue composition of loin. Back fat thickness affected the percentage of ham and loin in the carcass and the whole-tissue composition, as well as the lean meat content class (an exception is the content of bones in ham). Half-carcass mass is not a particularly good indicator of the size and tissue composition of ham and loin. Our results are a valuable source of information for pork processors because they allow a preliminary estimation of the production capacity of a meat plant.

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