

## INFLUENCE OF THE FATTENERS' SEX ON THE CARCASS TRAITS AND FATTY ACID COMPOSITION IN LOIN\*

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A study was carried out on 66 crossbred fatteners (Landrace × (Duroc × Pietrain)). Each sex group (boars, gilts and barrows) was represented by 22 animals. The animals were housed in group pens and were fed *ad libitum* with a mixture containing 13 MJ EM and 17% of crude protein per 1 kg. The study was undertaken to determine the carcass quality after slaughter and the fatty acid composition of loin by sex.

In this study, the best carcass composition was observed in boars. There was significant difference ( $p < 0.05$ ) in the meatiness in boar carcasses compared with the meatiness of gilt and barrow groups. Barrow carcasses were characterized by the highest fat and its average of backfat thickness was statistically significantly different ( $p < 0.05$ ) from the backfat thickness of the boar and gilt groups.

The analysis of fatty acid composition in *m. longissimus dorsi* samples shows that in the barrows group, the content of linoleic, linolenic acid and PUFA was significantly lower ( $p < 0.05$ ) in comparison to the content of these fatty acids in the loin of the gilts and boars groups.

### INTRODUCTION

Special position of pig meat in Polish meat consumption structure and the high content of fat comprising saturated fatty acids in comparison to beef and poultry meat are the main reasons why much research has focused on its dietetic value improvement [Grela, 2000; Johansson *et al.*, 2002; Enser *et al.*, 2000; Koczanowski *et al.*, 2002].

The nutritive value of pig meat depends, among others, on fat and cholesterol content as well as the fatty acid composition. The composition and fatness of pig carcasses are determined by many factors. Breed, growth rate, age, weight of slaughtered animals, feeding method and sex are the most important.

Kortz [1991], Ryszkowski and Żebrowski [1986] as well as Paschma *et al.* [1989 a, b] carried out research into evaluating the influence of sex on fattening results and carcass quality. They found that boars consumed the same quantity of feed as gilts and barrows and reached significantly higher daily gains and lower feed conversion per 1 kg of gain. Their carcasses were also more muscled and less fatty.

The results obtained by Nurnberg *et al.* [1989] and Cameron and Enser [1991] showed that boars had higher levels of linoleic acid and polyunsaturated fatty acids in comparison with gilts and barrows and their fat contained the lowest content of saturated fatty acids.

The aim of the present study was to evaluate the slaughter value and fatty acid profile in the loin of crossbred fatteners Polish Landrace × (Duroc × Pietrain) in relation to sex.

### MATERIAL AND METHODS

The study was conducted on 66 crossbreds Polish Landrace × (Duroc × Pietrain) divided into 3 groups comprising 22 boars, gilts and barrows. The animals were housed in group pens without straw bedding on a solid floor. The studied animals were fed *ad libitum* a complete mixture from automatic feeders. One kg of the mixture contained 13 MJ of metabolic energy and 17% crude protein. Fatteners were slaughtered after they reached 100 kg of body weight. To evaluate the fatty acid composition, the samples of loin were collected after slaughter from the thoracolumbar vertebrae area. The analysis was made using the gas chromatography method. Acids were assayed in methyl ester form. The samples of lipids were prepared according to the method of Folch *et al.* [1957]. Methyl esters of fatty acids were assayed in hexane extracts using a Varian 3400 gas chromatograph, the column was filled with CD-WAX 58 filling, using an autosampler 8200 CX. The carcasses were dissected according to SKURTCh procedures after being stored at a temperature of -4°C over 24 h.

The results were analyzed statistically using Statistica PL software.

### RESULTS AND DISCUSSION

The results of the evaluation of carcass slaughter value obtained in the present study are presented in Table 1. The highest dressing percentage was found in gilts (78.81%). The average dressing percentage found in gilts was higher by 0.1% than in barrows and exceeded by 1.2% the aver-

TABLE 1. Carcass slaughter value.

Items	Gilts		Barrows		Boars	
	n=22		n=22		n=22	
	x	s	x	s	x	s
Slaughter weight (kg)	100.71	6.65	102.33	5.13	100.14	8.52
Carcass weight (kg)	79.39	5.69	80.47	3.11	77.75	7.05
Dressing percentage (%)	78.81 <sup>a</sup>	1.33	78.71 <sup>ab</sup>	1.35	77.61 <sup>b</sup>	1.57
Ham weight (kg)	7.56	0.72	7.38	0.51	7.78	0.70
Loin weight (kg)	6.89	0.94	6.62	0.58	7.25	0.90
Eye of loin area (cm <sup>2</sup> )	53.43	5.58	48.88	4.85	51.25	6.24
Av. backfat thickness of 5 measurements (cm)	2.03 <sup>a</sup>	0.39	2.34 <sup>b</sup>	0.33	1.95 <sup>a</sup>	0.37
Meat content in primal cuts (kg)	21.23	2.07	20.47	1.11	21.78	1.96
Carcass meatiness (%)	53.43 <sup>a</sup>	2.83	50.94 <sup>a</sup>	2.91	56.09 <sup>b</sup>	2.57

a, b, c – values in the same rows with different letters are significantly different ( $p < 0.05$ ).

age values of this index observed in boars. The difference between the average dressing percentage of gilts and boars was statistically significant ( $p < 0.05$ ). Similar results were obtained by Paschma *et al.* [1989 a, b]. The high percentage of the primal cuts belonging to the highest commercial value was also observed in boar carcasses by many authors [Surdacki & Burdzanowski, 1985; Ryszkowski & Żebrowski, 1989; Wajda & Bielecki, 1991]. Similar observations were made in the present study. Average ham weight (7.78 kg) and loin weight (7.25 kg) in boars were higher in comparison to the average weight of those cuts observed in barrows and gilts. The largest loin eye area (53.43 cm<sup>2</sup>) was observed in gilts. The area of that muscle achieved by gilts was 2.18 cm<sup>2</sup> higher than in boars and exceeded the results reported for barrows by 4.55 cm<sup>2</sup>. The carcasses of barrows were the most fatty. The average backfat thickness based on 5 measurements in barrows was the highest (2.34 cm<sup>2</sup>) and statistically significantly ( $p < 0.05$ ) differed from the average backfat thickness in gilts and boars. Barrows had also the lowest meat content in primal cuts as well as the percentage of carcass meatiness. The highest carcass meatiness was observed in boars. The average value reached by boars was 56.09% and was higher than the average meatiness observed in gilts (by 2.66%) and in barrows (by 5.15%). The percentage meatiness of boars differed statistically significantly ( $p < 0.05$ ) from the results reported for that trait in the other sex groups.

An analysis of the fatty acid composition in loin showed the differences in some fatty acids level in relation to the sex of fatteners – Table 2. The highest stearic acid level in the *longissimus dorsi* muscle was found in barrows and the lowest was in gilts. The difference between the mentioned groups was statistically significant. The highest content of palmitic, stearic and arachidonic acid observed in barrows' loin was reflected in the percentage of saturated fatty acids in fatteners of that sex. Saturated fatty acids determined in barrows constituted over 43% of the total fatty acids analyzed and their level was higher by about 1.7% than that observed in gilts and boars. A higher concentration of SFA in loin fat of barrows in comparison to gilts was also found by Johansson *et al.* [2002], however, the results of research carried out by Riley *et al.* [2000] indicate that the SFA level in the loin of gilts was higher than the SFA level in boars. Nevertheless, Kondracki [2000] analyzed fatty acid composition in the fat

of loins of the Puławska and Large White breed and did not find any sexual influence.

The less advantageous composition of fat because of the lowest essential unsaturated fatty acids content, had the loin collected from barrows. Linoleic acid level as well as the linolenic acid level in individuals belonging to this sex were TABLE 2. The loin's fatty acids composition (%).

Fatty acids	Barrows	Gilts	Boars
Lauric acid C <sub>12:0</sub>	0.116	0.121	0.123
Myristic acid C <sub>14:0</sub>	1.72	1.76	1.60
Palmitic acid C <sub>16:0</sub>	28.12	27.81	26.90
Palmitoleic acid C <sub>16:1</sub>	2.69	3.22	2.62
Stearic acid C <sub>18:0</sub>	13.07 <sup>a</sup>	11.64 <sup>b</sup>	12.72 <sup>ab</sup>
Oleic acid C <sub>18:1</sub>	46.59	45.72	45.98
Linoleic acid C <sub>18:2</sub>	5.75 <sup>a</sup>	7.23 <sup>b</sup>	7.52 <sup>b</sup>
γ - linolenic acid C <sub>18:3</sub>	0.14	0.16	0.15
α - linolenic acid C <sub>18:3</sub>	0.29 <sup>a</sup>	0.31 <sup>a</sup>	0.37 <sup>b</sup>
CLA	0.19	0.23	0.23
Arachidic acid C <sub>20:0</sub>	0.10	0.06	0.09
Arachidonic acid C <sub>20:4</sub>	1.00	1.47	1.42
Timnodonic acid C <sub>20:5</sub>	0.038	0.041	0.043
Other fatty acids	0.20	0.25	0.23
Saturated fatty acids (SFA)	43.32	41.59	41.64
Unsaturated fatty acids (UFA)	56.68	58.41	58.36
Monounsaturated fatty acids (MUFA)	49.28	48.93	48.60
Polyunsaturated fatty acids (PUFA)	7.40 <sup>a</sup>	9.48 <sup>b</sup>	9.76 <sup>b</sup>
n-6 PUFA	6.88 <sup>a</sup>	8.85 <sup>b</sup>	9.10 <sup>b</sup>
n-3 PUFA	0.33 <sup>a</sup>	0.40 <sup>b</sup>	0.43 <sup>b</sup>
DFA	69.74	70.05	71.08
OFA	30.26	29.95	28.93
UFA/SFA	1.31	1.41	1.40
DFA/OFA	2.31	2.34	2.47
MUFA/SFA	1.14	1.18	1.17
PUFA/SFA	0.17 <sup>a</sup>	0.23 <sup>b</sup>	0.24 <sup>b</sup>
n-6 PUFA / n-3 PUFA	20.96	22.71	21.68

a, b, c – values in the same rows with different letters are significantly different ( $p < 0.05$ ).

the lowest. Although the level of linoleic acid found in other groups of fatteners was similar, the level of linolenic acid was higher in boars (by 20%).

According to Barowicz [1999], besides the essential unsaturated fatty acids content in diet, the mutual ratio between acids from *n*-6 and *n*-3 family is a very important factor. Most frequently this ratio amounts to 9:1, however the recommended ratio should reach 4:1 and the PUFA : SFA ratio should amount to 1:1. Dietetic proportions reported by Enser *et al.* [1996] reach 7.2 for PUFA *n*-6 : PUFA *n*-3 and 0.6 for PUFA : SFA. Taking into account the dietetic point of view, desirable polyunsaturated fatty acids were found in the examined boars' loin (9.76%). The level of those acids in gilts was significantly lower (9.48%). On the contrary, loin of barrows contained only 7.40% of PUFA on average. The differences of the average values between barrows and other sex were statistically significant. Parallel differences among groups, were found in PUFA from the *n*-6 and *n*-3 family. Despite differences in polyenic fatty acids level among groups, there were no statistically significant differences in the *n*-6 to *n*-3 ratio. This index remained at a similar level in all groups and amounted to 21.78 on average. Statistically significant differences in the PUFA : SFA ratio were observed among the results obtained in barrows (0.17) and other groups (gilts 0.23; boars 0.24). The relationships obtained in the present study are in agreement with the results of the research carried out by Nurnberg *et al.* [1998]. They reported that the SFA percentage in pigs, cattle and sheep rises in the order: males-females-castrates and that PUFA concentration decreases in a reverse order.

## CONCLUSIONS

The results obtained in the present study indicated the influence of fatteners' sex on the carcass slaughter value. The most advantageous carcass composition was found in boars. Their carcasses had the highest meatiness and the lowest fatness. The least desirable composition was in the barrows' carcasses. An analysis of the fatty acid profile in the loin fat of various sex groups indicated also that castrates, as a group, had a significantly lower content of linoleic, linolenic and PUFA acids, compared to the content of those acids in the loin of gilts and boars.

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## WPLYW PŁCI TUCZNIKÓW NA CECHY TUSZY I SKŁAD KWASÓW TŁUSZCZOWYCH POŁĘDWICY

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Badania przeprowadzono na 66 świniami mieszańcach pbz x (dur x pietr), po 22 knurki, loszki i wieprzki. Zwierzęta utrzymywane były w kojcach grupowych i żywione do woli z automatów paszowych mieszanką pełnodawkową, o wartości 13 MJ EM i 17% białka ogólnego w 1 kg. Po uboju analizowano skład tuszy oraz skład kwasów tłuszczowych w poledwicy w zależności od płci tuczników.

W przeprowadzonych badaniach najbardziej korzystny skład tuszy obserwowano w grupie knurków. Stwierdzono statystycznie istotnie wyższą zawartość mięsa w tuszach knurków w porównaniu z mięsnością tusz uzyskaną w grupach loszek i wieprzków (tab. 1). Tusze wieprzków charakteryzowały się największym otłuszczeniem, a ich średnia grubość słoniny była statystycznie istotnie wyższa od grubości słoniny uzyskanej przez loszki i knurki (tab. 1). Analiza profilu kwasów tłuszczowych w tłuszczu poledwicy różnych grup płciowych wskazuje na kastraty jako grupę o statystycznie istotnie niższym poziomie kwasu linolowego, linolenowego i wielonienasyconych kwasów tłuszczowych w porównaniu z udziałem tych kwasów w tłuszczu mięśnia najdłuższego grzbietu loszek i knurków (tab. 2).