CARCASS VALUE AND MEAT FATTY ACID COMPOSITION OF FATTENING GILTS AND BARROWS

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Abstract

The aim of the study was to examine the effect of gender on carcass value and fatty acid composition in meat of fattening pigs. Twenty pigs (gilts and barrows) were included in the experiment and fed ad-libitum with common feed mixture. Animals were slaughtered at 115 kg of body weight. Higher average daily gain was found in barrows (952.38 ± 191.78 g) compared to gilts (881.48 ± 131.57 g), higher lean meat content was measured in gilts ($P<0.01$). Fatty acid content was determined by gas chromatography method. Only α-linolenic acid content (Figure 1) was significantly ($P<0.05$) different in barrows (0.55 ± 0.07 g/100 g) compared to gilts (0.80 ± 0.24). Barrows also had significantly ($P< 0.05$) lower content of total n-3 polyunsaturated fatty acids (0.90 ± 0.10) than gilts (1.18 ± 0.26). From the results it is evident that gender is lesser important factor influencing the composition of fat and that a dietary treatment is necessary to influence fatty acid content in meat.

Key Words: Carcass value, gilt, barrow, fatty acid

Meat fatty acid composition is influenced by several factors-dietary treatment, gender, breed, fatness, body weight, environmental conditions (temperature), hormonal status. Differences in fatty acid composition between breeds and genotypes can be explained by differences in fatness. But nutrition has the largest impact on fatty acid profile in pork (De Smet et al., 2004). Meat fatty acid composition can be changed via the diet, linoleic, α-linolenic and long-chain polyunsaturated fatty acid (PUFA) content responds quickly to feeding higher levels of α-linolenic acid (e.g. in rapeseed) in pigs. Interest in meat fatty acid composition stems mainly from the need to find ways to produce healthier meat, i.e. with a higher ratio PUFA to saturated fatty acids and a more favourable balance between n-6 and n-3 PUFA (Wood et al., 2004). The level of food intake and composition of food regulates the rate of fatty tissue growth and the composition of lipids. There is a correlation between the amount of fatty tissue and fatty acid composition (Nürnberg et al., 1998).

Material and Methods

Twenty (Czech Landrace x Czech Large White) x line 48 pigs (gilts and barrows) were included into the experiment. Pigs were fed with common feed mixture for fattening pigs. The access to feed and water was *ad libitum.* Pigs were slaughtered at average body weight of 115.00 kg. Lean meat percentage were measured by FOM apparatus according to CSN 466164. Meat samples from *M. longissimus dorsi* were collected 24 h *post mortem*. Intramuscular fat content was determined in compliance with CSN 570185. Fatty acid content was determined by gas chromatography method. The lipid fraction was isolated by the method according to Folch et al. (1957), the preparation of the fatty acid methyl esters was done in accordance with CSN ISO 5509, fatty acid methyl esters were analysed by gas chromatography (6890N Agilent Technologies) according to CSN ISO 5508. The statistical evaluation was performed using the computer program QCExpert (TriloByte Statistical Software Ltd.) – t-test was used to evaluate statistical significance of differences between gilts and barrows. Data were presented as the mean, standard deviation (SD) and the significance levels.

Results and Discussion

Gilts and barrows in the experiment were fed with the same feed mixture for fattening pigs. Table 1 presents results of growth ability and carcass values of gilts and barrows. Higher average daily gain was found in barrows (952.38 ± 191.78 g) compared to gilts (881.48 ± 131.57 g) but the difference was not statistically significant ($P>0.05$). Lean meat percentage was significantly ($P<0.01$) higher in gilts (57.09 ± 2.06 %). In accordance with lean meat content, there was lower intramuscular fat content in gilts. Renaudeau et al. (2005) also found female pigs leaner ($P<0,05$) than the castrated males. Alonso et al. (2009) studied effect of gender on meat quality. Castrated males had more intramuscular fat in their experiment.

Composition of fatty acids in *M.longissimus dorsi et thoracis* was determined by gas chromatography method (Table 2). Lengerken et al. (1991) investigated the carcass fat quality and fatty acid composition in the *M. longissimus* of castrated pigs and sows. They found no difference in the fatty acid composition. The same result was achieved in our experiment. There were not significant differences in fatty acid content between gilts and barrows ($P>0.05$). Only α-linolenic acid content (Figure 1) was significantly ($P<0.05$) lower in barrows (0.55 ± 0.07 g/100 g) compared to gilts (0.80 ± 0.24).

Barrows also had significantly less (P< 0.05) total n-3 polyunsaturated fatty acids (0.90 ± 0.10) than gilts (1.18 ± 0.26).

Differences in fatty acid composition between genotypes can be explained by differences in fatness. The contents of saturated (SFA) and monounsaturated fatty acids (MUFA) increase faster with increasing fatness then those content of PUFA. The fat level also influences the n-6/n-3 PUFA ratio (DeSmet et al., 2004). The animals with higher meatness show lower SFA content and higher unsaturated fatty acids content in meat (Altmann et al., 1992). In the study by Renaudeau et al. (2005), pigs with a higher intramuscular fat percentage had more SFA and MUFA and lower concentration of linoleic and linolenic acid compared to pigs with lower intramuscular fat.). In our investigation, barrows with more intramuscular fat had more SFA and less unsaturated fatty acids. The results are in agreement with literary sources. Table 3 presents correlation coefficients between intramuscular fat content and fatty acid content regardless of a gender. Lengerken et al. (1991) investigated the carcass fat quality and fatty acid composition in the *M. longissimus* of castrated pigs and sows. The correlation coefficients between fatty acid composition and parameters of fattening performance and composition were in the low to medium range.

Table 1. Growth parameters and carcass values of gilts and barrows

Trait	Gilts	Barrows	Statistical significance
Average daily weight gain (g)	881.48 ± 131.57	952.38 ± 191.78	-
pH1	5.80 ± 0.39	5.87 ± 0.37	-
Lean meat (%)	57.09 ± 2.06	51.69 ± 3.17	**
Intramuscular fat (%)	2.33 ± 0.44	2.66 ± 0.48	-
Drip loss (%)	4.97 ± 2.04	4.65 ± 1.25	-

* P<0.05 **P<0.01

Table 2. Fatty acid content (g/100g of total fatty acids) in M.longissimus dorsi et thoracis of gilts and barrows

Fatty acid		Gilts	Barrows	Statistical significance
Myristic	C14:0	2.11 ± 0.17	1.92 ± 0.15	
Palmitic	C16:0	25.29 ± 0.77	25.62 ± 0.92	
Stearic	C18:0	12.23 ± 0.97	13.04 ± 0.76	
Oleic	C18:1n-9	34.42 ± 2.42	35.69 ± 2.73	
Linoleic	C18:2n-6	12.51 ± 1.96	10.53 ± 2.10	
α-linolenic	C18:3n-3	0.80 ± 0.24	0.55 ± 0.07	*
Arachidonic	C20:4n-6	2.19 ± 0.54	2.17 ± 0.61	
EPA	C20:5n-3	0.02 ± 0.01	0.02 ± 0.01	
DHA	C22:6n-3	0.11 ± 0.02	0.12 ± 0.02	
SFA		41.09 ± 1.62	41.89 ± 1.59	
UFA		58.91 ± 1.62	58.11 ± 1.59	
MUFA		42.06 ± 2.87	43.68 ± 3.43	
PUFA		16.85 ± 2.20	14.44 ± 2.84	
n-6		15.52 ± 2.03	13.40 ± 2.74	
n-3		1.18 ± 0.26	0.90 ± 0.10	*
n-6/n-3		13.42 ± 1.80	14.77 ± 1.59	

* P<0.05 **P<0.01

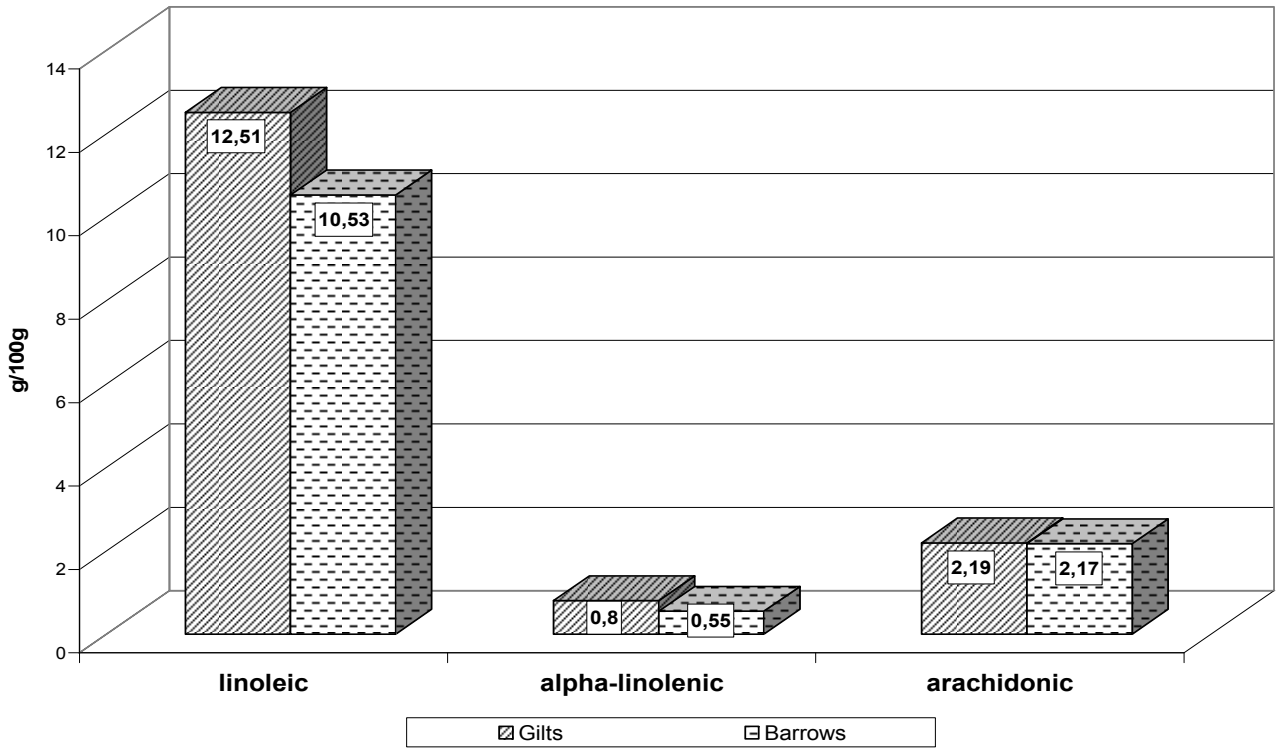
Table 3. Correlation coefficients between intramuscular fat content and fatty acid content in gilts and barrows

	Fatty acid				
	linoleic	α-linolenic	arachidonic	EPA	DHA
Intramuscular fat content	-0.398	-0.410	-0.110	-0.504 *	-0.289

	Fatty acid						
	SFA	UFA	MUFA	PUFA	n-6	n-3	n-6/n-3
Intramuscular fat content	-0.138	0.138	0.417	-0.403	-0.389	-0.434	0.124

* P<0.05 **P<0.01

Figure1. Fatty acid content in M.longissimus dorsi et thoracis depending on gender



Conclusion

The aim of the study was to evaluate the effect of gender on fatty acid composition in pork. There were no significant differences of sex on carcass value (except lean meat percentage) and growth parameters. Linoleic acid content tended to be lower in barrows as well as arachidonic acid. The content of α - linolenic acid was significantly higher in gilts. N-6/n-3 polyunsaturated fatty acid ratio was on high level in both gilts and barrows. The evaluated n-6/n-3 ratio do not correspond to recommended ratio beneficial for human health. It is evident that gender is lesser important factor influencing the composition of fat and that a dietary treatment is necessary to influence fatty acid content in meat.

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