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Carcass value and intramuscular fat content of pigs in dependence on sex and breed type

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ABSTRACT

The aim of study was to compare the carcass value and intramuscular fat content of two sexes – barrows and gilts, and of three hybrid genotypes commercially produced in conditions of the Slovak Republic. Carcass traits and intramuscular fat content of three different pig genotypes [WM – White Meaty x (Hampshire - HA x Pietrain - PN), n = 98; WM x Landrace - LA, n = 38 and WM x (Yorkshire - Y x PN), n = 22] were evaluated. Number of barrows and gilts was equal (n = 79). Pigs were slaughtered at average live weight of 109 kg. Day after the slaughter, detailed dissection of four main cuts (shoulder, loin, ham, belly) according to Walstra and Merkus method (1995) was done. Gilts had lower backfat thickness than barrows (25.66 vs. 28.95 mm) and higher meatiness of carcasses (57.67 vs. 52.95 % LMC). Intramuscular fat content of gilts was significantly lower than in barrows (1.96 and/or 2.48 %). Pigs of WMx(YxPN) have achieved the highest intramuscular fat content (2.40 %) but differences between genotypes were not significant. Determined correlations suggested some undesirable facts. Increasing the carcass weight resulted in higher backfat thickness of pigs regardless of sex and genotype. Desirable higher IMF content was in positive relations with BF and fatty parts but negative with LMC. To solve a lower meatiness of barrows, it is possible to perform separate fattening of gilts and barrows. Generally, the content of intramuscular fat within pig population of Slovakia is not sufficient. Therefore, it seems to be favourable to use the breeds with higher IMF content (e.g. Duroc) in pig breeding, and to include this trait into selection strategies, if need be.

INTRODUCTION

Last twenty to twenty-five years, the pig breeding is focused on increasing the lean meat content in the carcasses. Many studies suggested the important effect of slaughter weight, sex, nutrition, genotype and other factors on carcass value (Goodwin, 1988; Pulkrábek et al., 1992; Demo et al., 1994; Grzeskowiak, 1999; Dikić et al., 1999; Rogelj, 2000, etc.)

Increasing the lean meat in carcass is connected not only with decreased level of subcutaneous fat but also of intramuscular fat content (Schwörer et al., 1995). This fact has an undesirable impact upon the eating quality of pork (Hertzmann et al., 1988; Barton-Gade, 1990; Kaufmann and Warner, 1993; Fernandez et al., 1999; Latorre et al., 2004; Faucitano et al., 2004).

The aim of study was to compare the carcass value and intramuscular fat content of two sexes – barrows and gilts, and of three hybrid genotypes commercially produced in conditions of the Slovak Republic.

MATERIAL AND METHODS

Carcass traits and intramuscular fat content of three different pig genotypes [WM – White Meaty x (Hampshire - HA x Pietrain - PN), n = 98; WM x Landrace - LA, n = 38 and WM x (Yorkshire - Y x PN), n = 22] were evaluated. Number of barrows and gilts was equal (n = 79). Pigs were slaughtered at average live weight of 109 kg. Day after the slaughter, detailed dissection of four main cuts (shoulder, loin, ham, belly) according to Walstra and Merkus method (1995) was done. Carcass weight (CW), weight of half carcass (HC), average backfat thickness (BF), weight of lean meat (WLM), lean meat content (LMC), weight of fatty parts (WFP), percentage of fatty parts (PFP) were determined. Intramuscular fat content (IMF) was analysed using device INFRATEC (Germany) from samples (100 g) of *musculus longissimus dorsi* taken above the last rib. The obtained results were statistically performed using SAS/STAT (2002-2003), procedure MEANS was used for calculating the basic statistic characteristics, procedure CORR for calculating of Pearson correlation coefficients.

RESULTS AND DISCUSSION

Pigs were slaughtered at average carcass weight 88.45 kg (Tab. 1). Weight of half carcass was 43.91 kg without significant differences between barrows and gilts (88.47 vs. 88.43 kg and 44.02 vs. 43.79 kg, respectively). All other traits between both sexes were significantly different. Gilts had lower backfat thickness than barrows (25.66 vs. 28.95 mm) and higher meatiness expressed by lean meat content in carcasses (57.67 vs. 52.95 %). On the other hand, intramuscular fat content of gilts was significantly lower than in barrows (1.96 and/or 2.48 %).

Significant differences between three genotypes have been found in CW, HC, BF and WLM (Tab. 2). That was due to higher live weight of WMx(HAxPN) pigs, probably. However, the lean meat content of three pig genotypes was similar and non-significant (55.52, 55.63 and/or 53.79 %). Pigs of WMx(YxPN) have achieved the highest intramuscular fat content (2.40 %) but differences between genotypes were not significant.

Differences between both sexes within each hybrid genotype are shown in Tables 3, 4 and 5. The largest differences have been found in WMx(HAxPN) hybrids. Gilts had significantly lower backfat thickness and more meaty carcasses. Similar tendency was found also in other two hybrids. It was in agreement with studies of Larzul et al. (1997) and Cassady et al. (2004). On the other hand, barrows in our experiment had higher intramuscular fat content than gilts in all three genotypes but it was significantly different in two of three hybrids: WMx(HAxPN), (2.55 vs. 1.93 %) and WMx(YxPN), (2.61 vs. 1.94 %). Similar results are reported by Oliver et al. (1994); Latorre et al. (2003) and Correa et al. (2006).

Phenotypic correlations between some traits are given in Table 6. Carcass weight highly positive correlated with average backfat thickness in the whole data set, barrows and gilts (0.488^{**}, 0.566^{**}, 0.450^{**}) and also in all three hybrids (0.262^{**}, 0.428^{**}, 0.434^{**}). However, correlations between carcass weight and lean meat content were low in all cases except for WMxLA hybrids (-0.375^{*}). Similarly, correlations between carcass weight and IMF were low except for WMx(HAxPN) hybrids (-0.271^{**}). Percentage of fatty parts strongly correlated with lean meat content. All these correlations were negative (-0.858^{**} up to $–0.925^{**}$). Correlations of BF and LMC were also negative and high (-0.462^{**} to $–0.810^{**}$), they were lower for gilts only (-0.282^{*}). Backfat thickness correlated with IMF positively but not equally strongly in all cases. Higher correlations were found for barrows than for gilts (0.235^{*} vs. 0.135) and for WMx(HAxPN) than for other two hybrids (0.379^{**} vs. 0.139 and 0.196). Close correlations were found between percentage of fatty parts and IMF for all data set (0.534^{**}), whereas for WMxLA and WMx(YxPN) hybrids were lower (0.323^{*} and 0.321). Coefficients between lean meat content and IMF were negative and high ($-0.378^{**}$to $–0.583^{**}$) except for WMxLA and WMx(YxPN) hybrids (-0.212 and 0.355).

The results showed that gilts have achieved higher lean meat content than barrows by about 2.30 – 6.0 % at lower backfat thickness in all three genotypes. Intramuscular fat, which is connected with expression of characteristic pork properties, was higher in barrows than in gilts by about 0.5 %. However, significant differences between genotypes were not found for this trait. Cisneros et al. (1996) reported similar results, whereas Oliver et al. (1994) and Latorre et al. (2003) have found significant effect of genotype.

Determined correlations suggested some undesirable facts. Increasing the carcass weight resulted in higher backfat thickness of pigs regardless of sex and genotype. The relationships of BF and percentage of fatty parts with lean meat content were very negative and strong. Desirable higher IMF content was in positive relations with BF and fatty parts but negative with LMC. At present, the breeding on higher meatiness of pig carcasses has influenced negatively the intramuscular fat content.

CONCLUSION

The results of study have showed large differences in carcass value and intramuscular fat content between both sexes – barrows and gilts. It would be possible, to achieve a higher meatiness of barrows through separate fattening of sexes.

Differences between three genotypes in carcass traits were smaller than between sexes. Generally, the content of intramuscular fat within pig population of Slovakia is not sufficient. Therefore, it seems to be favourable to use the breeds with higher IMF content (e.g. Duroc) in pig breeding, and to include this trait into selection strategies, if need be.

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Table 1. Comparison of pigs performance according to sex

Trait	Total (n = 158)		Barrows (n = 79)		Gilts (n = 79)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Carcass weight, kg	88.45	10.63	88.47	10.70	88.43	10.63
Half carcass, kg	43.91	5.01	44.02	5.04	43.79	5.01
Backfat thickness, mm	27.30	5.49	28.95[a]	6.05	25.66[b]	4.31
Lean meat, kg	18.67	2.58	17.90[a]	2.23	19.44[b]	2.69
Lean meat content, %	55.31	4.37	52.95[a]	3.79	57.67[b]	3.58
Fatty parts, kg	8.58	2.07	9.54[a]	2.18	7.63[b]	1.42
Percentage of fatty parts, %	19.51	3.93	21.55[a]	3.81	17.47[b]	2.85
Intramuscular fat, %	2.22	0.71	2.48[a]	0.70	1.96[b]	0.61

[a, b] P<0.05

Table 2. Comparison of pigs performance according to breed type

Trait	WMx(HAxPN) (n = 98)		WMxLA (n = 38)		WMx(YxPN) (n = 22)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Carcass weight, kg	92.88[a]	9.47	82.13[b]	8.95	79.64[b]	6.67
Half carcass, kg	45.86[a]	4.54	41.12[b]	4.35	40.03[b]	3.40
Backfat thickness, mm	29.45[a]	5.29	23.62[b]	3.67	24.09[b]	3.92
Lean meat, kg	19.59[a]	2.60	17.56[b]	1.72	16.54[b]	1.52
Lean meat content, %	55.52	4.92	55.63	3.05	53.79	3.44
Fatty parts, kg	8.88	2.18	7.96	1.74	8.32	1.89
Percentage of fatty parts, %	19.36	4.31	19.22	2.93	20.68	3.59
Intramuscular fat, %	2.22	0.78	2.11	0.61	2.40	0.48

[a, b] P<0.05

Table 3. Differences between sexes in WMx(HAxPN) hybrid

Trait	Barrows (n = 46)			Gilts (n = 52)		
	Mean	S.D.	S_e	Mean	S.D.	S_e
Carcass weight, kg	92.87	9.92	1.46	92.88	9.15	1.27
Half carcass, kg	45.98	4.66	0.69	45.75	4.48	0.62
Backfat thickness, mm	32.24[a]	5.06	0.75	26.98[b]	4.19	0.58
Lean meat, kg	18.52[a]	2.35	0.35	20.53[b]	2.47	0.34
Lean meat content, %	52.36[a]	4.08	0.60	58.31[b]	3.80	0.53
Fatty parts, kg	10.25[a]	2.04	0.30	7.68[b]	1.48	0.20
Percentage of fatty parts, %	22.28[a]	3.89	0.57	16.77[b]	2.73	0.38
Intramuscular fat, %	2.55[a]	0.80	0.12	1.93[b]	0.62	0.09

[a, b] P<0.05

Table 4. Differences between sexes in WMxLA hybrid

Trait	Barrows (n = 18)			Gilts (n = 20)		
	Mean	S.D.	S_e	Mean	S.D.	S_e
Carcass weight, kg	84.00[a]	10.26	2.42	80.45[b]	7.47	1.67
Half carcass, kg	42.05	5.04	1.19	40.28	3.54	0.79
Backfat thickness, mm	24.48	3.89	0.92	22.85	3.38	0.75
Lean meat, kg	17.55	2.09	0.49	17.56	1.38	0.31
Lean meat content, %	54.36[a]	3.02	0.71	56.78[b]	2.65	0.59
Fatty parts, kg	8.53	1.90	0.45	7.44	1.45	0.32
Percentage of fatty parts, %	20.14[a]	2.99	0.70	18.40[b]	2.68	0.60
Intramuscular fat, %	2.19	0.53	0.13	2.04	0.68	0.15

Table 5. Differences between sexes in WMx(YxPN) hybrid

Trait	Barrows (n = 15)			Gilts (n = 7)		
	Mean	S.D.	S_e	Mean	S.D.	S_e
Carcass weight, kg	80.33	5.83	1.50	78.14	8.53	3.23
Half carcass, kg	40.39	3.06	0.79	39.26	4.18	1.58
Backfat thickness, mm	24.20	4.26	1.10	23.86	3.35	1.27
Lean meat, kg	16.43	1.04	0.27	16.75	2.35	0.89
Lean meat content, %	53.04[a]	3.41	0.88	55.39[b]	3.15	1.19
Fatty parts, kg	8.56	2.20	0.57	7.81	0.87	0.33
Percentage of fatty parts, %	21.00	4.09	1.06	20.00	2.26	0.85
Intramuscular fat, %	2.61[a]	0.40	0.10	1.94[b]	0.28	0.11

Table 6. Phenotypic correlations between some carcass traits

	Whole data set	Barrows	Gilts	WMx(HAxPN)	WMxLA	WMx(YxPN)
CW: BF	**0.488**	**0.566**	**0.450**	**0.262**	**0.428**	**0.434**
: LMC	-0.007	-0.167	0.164	0.029	**-0.375**	-0.227
: IMF	-0.154	-0.127	-0.212	**-0.271**	0.068	0.086
BF: LMC	**-0.472**	**-0.462**	**-0.282**	**-0.542**	**-0.810**	**-0.638**
: IMF	**0.285**	**0.235**	0.135	**0.379**	0.139	0.196
LMC: IMF	**-0.517**	**-0.427**	**-0.378**	**-0.583**	-0.212	-0.355
: PFP	**-0.912**	**-0.896**	**-0.866**	**-0.925**	**-0.873**	**-0.858**
PFP: IMF	**0.534**	**0.448**	**0.404**	**0.597**	**0.323**	0.321

Significant correlations (min P<0.05) are indicated by bold type