PE9.12 Sire and sex on pork subcutaneous fat fatty acid profile and indices for enzyme activities 91.00

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Abstract—In this study, the effect of sire and sex on the fatty acid profile of subcutaneous fat was investigated. Therefore subcutaneous fat was taken from Duroc and Yorkshire 48 females and castrates. All animals had been fattened on the same diet and were slaughtered at a live weight of approximately 110 Kg. Fatty acid composition of inner and outler layer were determined. Indices for the activities of Δ9 desaturase, as well as elongase activity were estimated from ratios of product to precursor fatty acid. Sire affected significantly the fatty acid composition, the Δ9 desaturase C16:1/C16:0 and the elongase C18:1/16:1 indices in subcutaneous fat. No sex effects were found on fatty acid composition and on enzyme activities indices involved in MUFA metabolism.

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Index Terms—Pig, pork, subcutaneous fat, fatty acids .

I. INTRODUCTION

Fatty acid (FA) composition in animal fats has received considerable interest due to its implications for human health and for fat quality. It is well established that the FA composition of pork fats is determined by genetic factors as breed, sex and genotype, and environmental factors of which diet is by far the most important one (1,2). Evidence for breed differences in fatty acid composition and in the activities of several enzymes involved in fat synthesis and fatty acid metabolism has been cited in several studies (3). The Δ9 desaturase catalyses the conversion of SFA in MUFA. The aim of this study was to investigate the effect of sex and sire differences on the pork subcutaneous fatty acid profile. Particular attention was paid to differences in the indices for enzyme activities involved in MUFA metabolism.

II. MATERIALS AND METHODS

Samples for this study originated from the Program of Pig Genetic Improvement conducted by INTA. Sires from Duroc (D) and Yorkshire (Y) lines were used to produce hybrid progeny. Starting at 30 kg live weigh barrows and gilts of each genotype were kept in identical condition until slaughtered at 110 kg. Samples of subcutaneous fat were taken at the height of the 3th/4th last rib and stored at -20°C Subcutaneous fat lipids were extracted using chloroform / methanol (2/1, v/v) adapted from the method of Folch et al. (4). The FA methyl esters (FAME) were anaysed on a Chrompack 900 gas chromatograph with a CP-Sil 88 capillary column. Peaks were identified on the basis of their respective retention times. All data are expresed as g/100 of FAME. The indices for the activities of Δ desaturases as well as the elongase activity, were estimated by the ratios of product to precursor fatty acids. Data were analyzed using the general linear model procedure (SAS 8.0 Institute, Inc., Cary, NC). Differences between mean values were assessed by the Tukey test for sires and t-student for sex.

III. RESULTS AND DISCUSSION

Sex and sire effects on fatty acid composition of the inner (IL) and outler layers (OL) of subcutaneous fat are given in Tables 1 and 2. D subcutaneous fat presented in both layers, compared to Y, higher levels of saturated fatty acids C14:0 and C16:0 but no changes in C18:0. C16:1 was higher also in D but no changes in C18:1 were detected. The polyunsaturated C18:2 n-6 y C18:3 n-3 were in Y higher in the IL from Y compared to D but in the OL were detected significant interactions sex x sire.

Table 1. Sex and sire effects on fatty acid composition of the inner layer of subcutaneous pork fat (g/100g FAME).

Fatty acid	Duroc M F	Yorkshire M F	Sire	Sex	Sire x sex
C14:0	1.63±0.08a 1.66±0.19a	1.34±0.14b 1.40±0.16b	***	NS	NS
C16:0	27.41±0.93a 27.53±2.16a	25.15±1.61b 25.02±1.95b	***	NS	NS
C18:0	14.14±0.87 14.15±1.44	15.49±0.77 14.91±1.66	**	NS	NS
C16:1	2.46±0.20a 2.33±0.24a	1.80±0.19b 1.94±0.34b	***	NS	NS
C18:1	41.31±1.97 41.11±1.79	41.65±1.54 41.67±1.81	NS	NS	NS
C18:2	7.93±1.87b 8.08±1.99b	9.04±1.81a 9.62±2.03a	***	NS	NS
C18:3	0.52±0.10b 0.51±0.14b	0.62±0.11a 0.63±0.11a	***	NS	NS

** p<0.01 *** p<0.001 Means in the same row with different letters are significantly different.

Table 2. Sex and sire effects on fatty acid composition of the outler layer of subcutaneous pork fat (g/100g FAME).

	Duroc M F	Yorkshire M F	Sire	Sex	Sire x sex
C14:0	1.64±0.09a 1.70±0.17a	1.47±0.14b 1.38±0.13b	***	NS	NS
C16:0	25.44±1.08a 27.53±2.16a	24.08±1.30b 23.16±1.31b	***	NS	NS
C18:0	11.36±1.07 14.15±1.44	11.51±0.91 11.60±1.39	NS	NS	NS
C16:1	2.95±0.34a 2.36±0.24a	2.50±0.25b 2.40±0.33b	***	NS	NS
C18:1	42.96±1.59 41.11±1.79	44.36±1.11 43.97±1.65	NS	NS	NS
C18:2	10.30±1.22ab 9.22±1.60b	9.88±2.10ab 12.04±2.25a	**	NS	**
C18:3	0.58±0.07bc 0.49±0.09c	0.58±0.12 b 0.73±0.10a	***	NS	***

** p<0.01 *** p<0.001 Means in the same row with different letters are significantly different.

Means values for different indices of Δ9 desaturase and elongase activty in IL and Ol are given in Tables 3 & 4. The Δ9 desaturase C16:1/C16:0 was affected by sire in both layers.

On the contrary there was no effect of sex on this indice. A significant effect for sex x sire was detected (p<0.005)in the OL. The Δ9 desaturase C18:1/C18:0 was only affected by sire in the IL. The elongase indice C18:1716:1 was affected by sire in both layers.

Table 3. Sex and sire effects on indices of Δ desaturase and elongase activity involved in MFA metabolism in the inner layer of subcutaneous pork fat (g/100g FAME).

	Duroc M F	Yorkshire M F	Sire	Sex	Sire x sex
C16:1/16:0	0.09±0.005a 0.08±0.005ab	0.07±0.006bc 0.07±0.007c	***	NS	**
C18:1/C18:0	2.94±0.28 2.94±0.30	2.69±0.18 2.84±0.43	NS	NS	NS
C18:1/C16:1	16.92±1.59b 17.86±2.23b	23.38±2.53a 22.10±2.08a	***	NS	NS

Table 4. Sex and sire effects on indices of Δ desaturase and elongase activity involved in MFA metabolism in the outler layer of subcutaneous pork (g/100g FAME).

	Duroc M F	Yorkshire M F	Sire	Sex	Sire x sex
C16:1/16:0	0.11±0.009a 0.11±0.05ab	0.10±0.01b 0.10±0.008b	0.01	NS	***
C18:1/C18:0	3.82±0.23 3.92±0.44	3.88±0.32 3.84±0.43	NS	NS	NS
C18:1/C16:1	14.69±0.85b 5.52±1.23b	17.90±1.27a 18.61±1.22a	NS	NS	NS

** p<0.01 *** p<0.001. Means in the same row with different letters are significantly different.

IV. CONCLUSION

Sire affected significantly the fatty acid composition, the Δ9 desaturase C16:1/C16:0 and the elongase C18:1/16:1 indices in subcutaneous fat. No sex effects were found on fatty acid composition and on enzyme activitiy indices involved in MUFA metabolism.

REFERENCES

[1] Alonso, V., Campo, M. M. Español, S., Roncales, P. & Beltran, J.A., (2009). Effect of crossbreeding and gender on meat quality and fatty acid composition. Meat Science, 81, 209-217.

[2] Ntawubizi, M., Raes, K., Buys, N.& De Smet S. (2009) Effect of sire and sex on the intramuscular fatty acid profile and indices for enzyme activities in pigs. Livestock Science 122; 264-270

[3] De Smet, S., Raes, K & Demeyer, D. (2004). Meat fatty acid composition as affected by fatness and genetic factors: A review. Animal Reseach, 53,81-98

[4] Folch, J., Lees, M., Sloane Stanley, G.H. (1957) A simple method for the isolation and purification of total lipids from animal tissues. J. Biol. Chem. 226, 497-509