FATTY ACID COMPOSITION OF SUBCUTANEOUS FAT FROM DRY-CURED FORELEGS OF PIGS FED ON DIETS WITH CHESTNUTS AND SUGAR-BEET PULP

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Background

In Galicia (Spain), pigs were fattened with chestnuts, roots, grains, grass and by-products of the agriculture. Nowadays, pigs are fattened with concentrated diets and due to this reason, the composition of the meat has changed. It would be interested to recover some of these ingredients in the feeding of the pigs. Sugar-beet pulp has high content in digestible fibre, pectins and sugars (Cobos et al, 1995). There are some studies (Lizardo et al, 1997, Rosenvold et al, 2001) about the effects of the inclusion of sugar beet pulp in diets for growing-finishing pigs. On the other hand, the chestnuts contain high percentage of carbohydrates, mainly sucrose (34%) and starch (De la Montaña et al, 1997). The chestnuts also contain 6.2% proteins and 2.7% lipids with high levels of linoleic acid (46.7%) (Coutron-Gambotti et al, 1998). These authors reported that, in the sylvo-pastoral extensive system in Corsica, pigs are fattened with chestnuts. The triglycerides in pigs fattened with chestnuts exhibited a higher level of polyunsaturated fatty acids (C-18:2 n-6) than those in pigs fattened with the concentrated diet (Coutron-Gambotti et al, 1998). Fats from the diet constitute the greatest source of variation in the composition of fatty acids of meat lipids, especially in monogastric animals (Cobos et al, 1994). However, the mechanism of regulation of the *de novo* synthesis of fatty acids from carbohydrates could also affect the fatty acid composition of the meat (Coutron-Gambotti et al, 1998).

Objectives

The objective of this study was to investigate the effect of the inclusion on the diet of 15% of chestnuts and 10% of sugar beet pulp on the fatty acid composition of subcutaneous fat of dry-cured forelegs.

Methods

Samples of subcutaneous fat of 10 dry-cured forelegs from 10 pigs were analysed. 5 pigs were fed on a conventional diet. The other 5 pigs were fattened with a diet with 15% of chestnuts and 10% of sugar beet pulp. Large White-Landrace x Pietrain genotype pigs were used. The lipid content and fatty acid composition of the diets are provided in Table 1. Lipids of the diets were extracted according to the method described by Hanson and Olley (1963).

The fatty acid composition of diets and subcutaneous fat was determined by gas liquid chromatography of methyl esters prepared in basic conditions (KOH: methanol). The gas chromatograph was a Hewlett-Packard apparatus (HP 5890) equipped with a dual flame ionization detector. The capillary column (30 m, internal diameter 0.25 mm) was packed with OV-225 (0.1 μm) on fused silica. Analysis was performed using a initial isothermic period (150ºC, 2 min), thereafter the temperature was increased to 210ºC at an increasing rate of 4ºC/min, and finally an isothermic period (210ºC, 15 min) was established. The injector and detector were maintained at 250ºC. For quantitative analyses, a Hewlett-Packard HP3394A integrator was used. Identification of different fatty acid methyl esters was performed by comparison of the retention times with those of authentic standards (Sigma) and response factors were determined for all fatty acids by injecting samples containing a known amount of FAME standard. Amounts of fatty acids were expressed as percent of total area of injected methyl esters.

Statistical treatment was performed by using Student´s t-test for comparison between means of pigs fed on control diet and pigs fed on diet with 15% of chestnut and 10% of sugar-beet pulp (SPSS version 9.0.1. for Windows, 1998).

Results and discussion

Table 2 shows the fatty acid profiles of subcutaneous fat in dry-cured forelegs of pigs fattened with the two diets. In subcutaneous fat of control pigs, the monounsaturated fatty acids were the most abundant (46.8%) followed by the saturated fatty acids (40.2%). Oleic, palmitic, stearic and linoleic acids were the main fatty acids. These results are close to those reported for fatty acid composition of adipose tissue of pork observed by Enser et al. (1996). Fatty acid composition of subcutaneous fat in dry-cured forelegs from pigs fed diet with chestnut and sugar beet pulp showed a significant higher content of oleic and linoleic acids and lower levels of stearic and arachidonic acids than subcutaneous fat of control pigs. The two diets exhibited fairly similar fatty acid compositions; however, the higher level of lipids of the diet with chestnuts and sugar-beet pulp could affect the level of oleic and linoleic acids of subcutaneous fat. However, the differences can also be explained by the mechanism of regulation of the *de novo* synthesis of fatty acids from carbohydrates or of the desaturation and elongation of endogenous and dietary fatty acids (Coutron-Gambotti et al, 1998).

Conclusions

Subcutaneous fat from dry cured pork forelegs of pigs fed diets with 15% of chestnuts and 10% of sugar beet pulp was more unsaturated (higher levels of oleic and linoleic acids) than that from pigs fed control diet.

Pertinent literature

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Table 1. Lipid composition of control diet and diet with 15% chestnut and 10% sugar-beet pulp

	C	Ch + SBP
Total lipids (wet matter %)	3.77	4.43
Fatty acid composition (weight %)		
C-14:0	0.71	1.22
C-16:0	19.99	19.43
C-16:1 n-9	0.23	0.30
C-16:1 n-7	1.06	1.23
C-17:0	0.17	0.34
C-17:1 n-9	0.14	0.15
C-18:0	6.36	7.03
C-18:1 n-9	29.84	27.77
C-18:1 n-7	2.11	1.67
C-18:2 n-6	34.85	36.85
C-18:3 n-3	3.47	3.42
C-20:0	0.20	0.17
C-20:1 n-9	0.63	0.29
C-20:2 n-6	0.21	0.11
C-20:4 n-6	0.04	0.02

C: Control diet; Ch + SBP: Diet with chestnut and sugar-beet pulp

Table 2. Fatty acid profiles (weight %) (mean±S.D.) of subcutaneous fat from dry cured foreleg of pigs fed on control diet (n=5) and diet with chestnut and sugar-beet pulp (n=5)

Fatty acid	C	Ch + SBP	P
C-14:0	1.38 ± 0.13	1.06 ± 0.59	n.s.
C-16:0	23.35 ± 0.99	22.37 ± 2.28	n.s.
C-16:1 n-9	0.47 ± 0.07	0.30 ± 0.15	n.s.
C-16:1 n-7	2.91 ± 0.49	2.01 ± 0.39	*
C-17:0	0.27 ± 0.06	0.34 ± 0.17	n.s.
C-17:1	0.32 ± 0.06	0.25 ± 0.16	n.s.
C-18:0	15.25 ± 2.63	7.14 ± 2.77	**
C-18:1 n-9	39.10 ± 2.52	45.56 ± 2.08	**
C-18:1 n-7	3.00 ± 0.36	3.85 ± 0.92	n.s.
C-18:2 n-6	11.41 ± 1.85	15.15 ± 0.86	*
C-18:3 n-3	0.82 ± 0.14	1.09 ± 0.27	n.s.
C-20:1 n-9	0.98 ± 0.09	0.52 ± 0.35	*
C-20:2 n-6	0.54 ± 0.07	0.27 ± 0.04	***
C-20:4 n-6	0.21 ± 0.04	0.11 ± 0.03	**
SFA	40.24 ± 2.28	30.90 ± 1.43	***
MUFA	46.77 ± 3.07	52.49 ± 2.46	*
PUFA	12.99 ± 2.07	16.62 ± 1.09	*

C: control diet; Ch + SBP: diet with chestnut and sugar-beet pulp

SFA: Saturated fatty acids MUFA: Monounsaturated fatty acids PUFA: Polyunsaturated fatty acids

n.s.: not significant ($p>0.05$), * $p<0.05$, ** $p<0.01$, *** $p<0.001$