FATTY ACID COMPOSITION OF THE LARD, MUSCLE AND LIVER FAT FROM IBERIAN PIGS

María O. López*, Lorenzo de la Hoz*, María I. Cambero*, Emiliano Gallardo**, Pedro J. Martín-Alvarez*** and Juan A Ordóñez*.

*Departamento de Higiene y Tecnología de los Alimentos, Facultad de Veterinaria, Universidad Complutense, 28040 Madrid (Spain)
** Veterinario Titular. Fuentes de León. Badajoz (Spain)
*** Instituto de Fermentaciones Industriales (CSIC). Juan de la Cierva, 3. 28006-Madrid (Spain)

INTRODUCTION

Iberian pigs acquire a great economical importance in some Spanish regions (those included in the southwestern and part of the western area) since they are used for the production of several dry meat products, which are very appreciate by consumers. From a economical point of view, the hams are those adquiring the most transcendental implications. The hams reach different prices in the market depending on the feeding the animals were fed, being the most expensive and appreciate products those from pigs fed exclusively with pasture and acorns (*Quercus ilex*, *Q. rotundifolia* and *Q. suber*) during the fattening phase (last four months). This kind of feeding is usually denomined as "montanera". However, other types of feeding are also possible. One of them is the "recebo"., in which the pigs are also feed on acorns but in the last two months of fattening the animals receive a commercial diet composed with cereals.

Since the price of animals "in vivo" is also higher for "montanera" pigs, it is very interesting for meat processors to have available an analytical method able to discriminate cacasses from pigs received 'montanera" or "recebo" feeding.

In an attempt to reach this goal, the fat content, refraction index and

fatty acid composition of the lard, muscle and liver fat were studied

MATERIAL AND METHODS

Two batches of pigs composed each one by 15 animals were used. According to the type of feeding they were denomined "montanera" and "recebo". Samples (portions of liver, rhomboides and splenium muscles and back lard) from pork 24 hours post-morten were homogenated in a Polytron PT20 blender. Lipids were extracted according to the Hanson and Olley (1963) method. Total lipids were gravimetrically determined. Fatty acid methyl esters of lipids were formed by the method of Firestone and Horwitz (1979) and analyzed by G.L.C. in a Konik KNK 3000-HRGC apparatus equipped with a 25 m capillar column (SGE, BP5).

The refraction index was measured at 40°C with a Zeiss refractometer.

The statistical method used for the data processing have been the Spepwise Discriminant Analysis (SDA). The BMDP package (Dixon, 1983) was used for SDA (BMDP7M program). This program was run in a CDC Cyber 180/855 computer.

RESULS AND DISCUSSION

Fat content, refraction index and fatty acids composition of fat from liver, muscles and lard are shown in Table 1, 2 and 3, respectively. The liver fat content of "montanera" batch showed a mean value of 7.05 (±1.15) while in "recebo" batch was of 5.74 (±0.99). These values were significantly different ($p \leq 0.005$). Similary, the refraction index of "montanera" liver fat was significantly higher than that of the "recebo" batch. Therefore, the liver fat content and their refraction index are promissing parameters to be used as potential indicator for assessing the type of feeding that animals received, which could allow a commercial carcasses characterization for

ham production.

GLC analysis of fatty acid methyl esters of liver fat revealed the presence of more than fifteen fatty acids, the dominant ones being showed in table 1. As expected according to the reports of other authors (Paul and Southgate, 1978), the C-18:1, C-18:0 and C-16:0 were the fatty acid found in the highest concentrations. The unidentified fatty acid denomined NI3 reached an important level, even higher than C-18:3 and C-16:1. This fatty acid could be C-20:4 because it has been reported in liver fat in concentrations higher than 10% (Paul and Southgate, 1978). This fact is due, without doubt, to the high content of phospholipids in liver (about 50%) in which the C-20:4 reachs values higher than 15% (López, unpublished data). The statistical analysis of the values reached by the fatty acid of liver fat from "montanera" and "recebo" batches showed that C-16:0, C-14:0, C-16:1 and C-18:3 were significantly higher ($p \leq 0.005$) in "recebo" batch and C-18:1 was the only significantly higher in the "montanera" batch.

The muscular fat content (Table 2) of "montanera" batch showed a mean value of 11.45 (±3.59) while in "recebo" batch was of 7.85 (±2.64). The refraction index of "montanera" muscular fat was lower (1.4613±0.0010) than that of the "recebo" batch (1.4629±0.0006). GLC analysis of fatty acid methyl esters of muscular fat showed significative differences ($p \leq 0.005$) in C-14:0, C-16:0, C-16:1, C-18:0 and C-18:3. The main fatty acids and their significance are in Table 2. The C-18:1, C-16:0 and C-18:0 represented together more than 80% of total fatty acid. The C-18:1 was the dominant fatty acid in both batches although significative differences were not found. In general, similar percentages of fatty acids has been described by Flores et al., (1987). which analyzed samples of fat from subcutaneous tissue of green ham from Iberian pigs.

The fat content, the refraction index and the fatty acid composition

of the lard are showed in Table 3. Refraction index showed significantly higher values in "montanera" batch than in "recebo" one. Statistical differences ($p \leq 0.005$) were found in the fatty acids C-14:0, C-16:0 and C-16:1 although the more abundant one was C-18:1, which achieves an average values of 49.26±3.08 in "montanera" and 47.31±1.80 in "recebo".

When the data of Tables 1, 2 and 3 were used to discriminate samples from the "montanera" and "recebo" batch only some fatty acids showed a discriminant power (Table 4). In the liver fat the C-18:3 presented the highest discriminant power allowing a correct classification of the 89.7% of samples. The liver fat allowed a correct classification of the 100% of samples using the fatty acids C-18:3, C-18:1 and C-16:1.

The muscular fat and lard allow to classify correctly more than the 90% of samples using the C-16:1 but never was possible to classify correctly the 100% of samples.

The liver fat appears to be the most promissing sample to be used. The fat content, the refraction index and the concentration of the fatty acids C-14:0, C-16:0, C-16:1, C-18:1 and C-18:3 from liver showed significatives differences between batches. Therefore, these parameters are the most promissing parameters to be used as potential indicators for assessing the type of feeding that pigs received, which could allow a commercial carcasses characterization for ham production.

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ACKNOWLEDGMENTS

This work was supported by a grant from the Instituto Nacional de Denominación de Origen (INDO), Ministerio de Agricultura, Pesca y Alimentación. M.O.L. was the beneficiary of a scholarship of Universidad Complutense. We should like to thank CARDENO S.A. for supplying samples.

Table 1. Fat content (% wet weight) of liver and refraction index and fatty acid composition (weight%) of the liver fat from Iberian pigs

	Batch			
	Montanera		Recebo	
	Mean	S.D.	Mean	S.D.
*Fat	7.06	1.15	5.74	0.99
*Refraction index	1.4767	0.0031	1.4722	0.0007
Fatty acid:				
*C-14:0	0.85	0.29	0.87	0.19
NI 1	0.58	0.30	0.54	0.34
NI 2	0.93	0.29	0.83	0.17
*C-16:0	17.74	2.17	19.29	1.26
*C-16:1	1.31	0.40	1.76	0.26
C-18:0	19.89	2.95	20.44	3.03
*C-18:1	30.95	4.24	26.69	2.82
C-18:2	11.53	0.90	12.06	1.17
*C-18:3	2.29	0.25	2.93	0.34
NI 3	10.30	2.93	10.92	1.80
NI 4	1.14	0.93	1.00	0.70
NI 5	1.21	0.55	0.89	0.48
NI 6	1.37	0.47	1.66	0.26

number of samples = 15 per batch
"montanera" pigs fed on the fattening phase with pasture and acorn
"recebo" pigs fed on the fattening phase with pasture and acorn complemented (last two months) with a commercial diet
* Significant differences, ($p \leq 0.005$) between batches

Table 2. Fat content (% wet weight)of muscle and refraction index and fatty acid composition (weight%) of the muscle fat from Iberian pigs

	Batch			
	Montanera		Recebo	
	Mean	S.D.	Mean	S.D.
*Fat	11.45	3.59	7.85	2.64
Refraction index	1.4613	0.0010	1.4629	0.0006
Fatty acid:				
*C-14:0	1.90	0.84	1.37	0.20
*C-16:0	25.65	1.26	26.44	0.92
*C-16:1	3.10	0.40	4.11	0.27
*C-18:0	13.33	3.08	11.16	0.83
C-18:1	45.73	3.11	47.23	1.04
C-18:2	4.98	1.28	4.70	0.54
*C-18:3	4.19	0.34	4.97	0.42

Legend as in Table 1

Table 3. Fat content (% wet weight), refraction index and fatty acid composition (weight%) of the lard from Iberian pigs

	Batch			
	Montanera		Recebo	
	Mean	S.D.	Mean	S.D.
Fat	91.99	2.47	93.01	1.34
*Refraction index	1.4598	0.0001	1.4584	0.0003
Fatty acid:				
*C-14:0	1.31	0.14	1.52	0.20
*C-16:0	22.64	1.08	24.71	1.30
*C-16:1	1.45	0.28	2.20	0.24
C-18:0	14.01	2.76	12.78	1.48
C-18:1	49.26	3.08	47.31	1.80
C-18:2	6.44	1.24	6.90	1.02
C-18:3	2.94	0.67	3.39	0.45

Legend as in Table 1

Table 4. Selected variables and correct classification (%) of "montanera" and "recebo" samples from lard and hepatic and muscular fat according to the statistical analysis applied..

Fat	Selected variables according to their discriminant power	Correct classification (%)
Hepatic	C-18:3	89.7
	C-18:3, C-18:1	96.6
	C-18:3, C-18:1, C-16:1	100
Muscular	C-16:1	93.1
	C-16:1, C-18:3	96.6
Lard	C-16:1	92.9
	C-16:1, C-16:0	92.9