FATTY ACID COMPOSITION OF RAW AND CURED HAM FAT OF CINTA SENESE AND LARGE WHITExCINTA SENESE PIG AS AFFECTED BY REARING SYSTEM

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Background

The recovery and the valorisation of Cinta senese pig represent important aspects of the project to the protection of animal genetic resources in Tuscany. The concrete possibility of recovery of the breed is linked to the opportunity to create niches of market of typical products with high added value. In this framework the Tuscany ham of Cinta senese assumes a remarkable economical and cultural importance, associating the characteristics of a typical technology of transformation to the peculiarities of the racial origin.

Objectives

Accurate breed evaluation might require an understanding of the interactions between management systems and breed characteristics with trials under controlled field conditions and under the traditional Mediterranean extensive system (López-Bote, 1998). The aim of this work was to evaluate fat quality traits of Cinta Senese pigs, their crosses with Large White and Large White as control, under confined or traditional extensive conditions.

Methods

Thirty three pigs, belonging to two genetic types, Cinta senese (C) and Cinta senese x Large White (LWxC) were raised under traditional extensive system in oak and chestnut woods pasture with moderate feed supplementation during spring and summer. Contemporary seventy pigs belonging to three genetic types, C, LWxC and Large White (LW) were reared intensively in pens and fed usual commercial mixtures given *semi-ad libitum* (max. 2.5 kg/d). LW pigs were employed only in the intensive system as reference breed. Following the traditional sylvo-pastoral management system, all the males and females were castrated both in outdoor and in indoor systems. On overall, animals were slaughtered when they reached the appropriate weight for medium/heavy pig (130-160 kg). Further details on the procedure of overall experiment and on the results concerning *in vita* performance and carcass traits are reported in previous works (Franci et al., 2001; Acciaioli et al., 2001). At slaughter samples of backfat (outer layer), in correspondence of *Gluteus medius* muscle, were removed. After seasoning of ham samples of fat (outer layer) were taken. Both samples, raw and cured, were submitted to the following analyses: i) water content ii) total lipids content (Folch, 1957); iii) fatty acid profile of total lipids. Data were analysed by procedure GLM of SAS (1997) including genotype x rearing system and sex as fixed effects.

Results and discussion

The chemical composition of fresh adipose tissue is reported in table 1. Cinta senese breed showed the lowest value of moisture, associated with the highest lipids percentage, probably due to the highest age at slaughter of this breed (Acciaioli et al. 2002). Mainly, this result is associated to the highest adiposity of carcass of Cinta senese (Acciaioli et al. 2002) as usual in the local pig breeds (Labroue et al., 2000). Table 1 also reports fatty acid composition of raw fat. As concern the myristic and palmitic saturated fatty acids, negatively involved in the dietetic quality, little differences among breeds were found, while the rearing system strongly affected their content. On average C14:0 and C16:0 were 25% and 15% lower in the free-range than in the indoor system, respectively. Oleic acid percentage was more variable among breeds, as it appears within the indoor system. Cinta senese breed showed the highest percentage of C18:1 confirming the highest value of this component in unimproved breeds (Oliver et al.,1997). Actually, oleic acid content appears strictly connected also with feeding source and for Cinta Senese breed it was higher in the outdoor than in the indoor system, confirming the results of Andrés et al. (2001) which explained the highest C18:1 content of fat of free-range pigs with the high oleic acid content of acorns. On the contrary, LWxC showed lower percentage of oleic acid and MUFA in outdoor system than in indoor because of they were slaughtered before acorns production. However they showed the highest values of PUFA *n-3* and PUFA *n-6,* probably due to the feeding, mainly based on grass. Cinta senese showed also higher percentage of PUFA *n-3* and PUFA *n-6* in the outdoor than in the indoor system, indicating that the higher unsaturation of fat in free-range pigs is due to the feeding source based on acorn and grass. The highest percentage of PUFA *n-3* and *n-6* recorded in free-ranged pigs are associated with lowest atherogenicity and thrombogenicity indexes which, in turns, indicate the levels of antiatherogenic (reduction of serum lipid) fatty acids (PUFA *n-6*) and antithrombogenic (reduction of platelet activity) fatty acids (PUFA *n-3*) as pointed out by Ulbricht and Southgate (1991).

There were no significant differences for moisture and lipids content of seasoned fat between genetic–type x rearing system combinations (Table 2). The seasoning process avoided the differences found in the fresh fat. As regard the fatty acid profile the differences found in raw fat among genetic-type and rearing system combinations were confirmed on cured fat. Besides the statistical comparison, curing seems to increase the percentage of myristic (C140:0) and stearic (C180:0) acids and to decrease the percentage of linoleic (C18:2) acid.

It is possible to deduce that the extensive rearing system improves the dietetic property of fat both in raw and seasoned ham.

Pertinent literature

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Table 1. Chemical composition of raw fat

	outdoor			indoor		RSD
	C	LWxC	C	LWxC	LW	
Moisture %	5.44a	8.80d	6.53b	6.92b	7.73c	1.149
Lipid %	82.21a	77.71b	81.41a	78.12b	77.46b	3.09
Fatty acid %:						
14:0	0.970b	0.904a	1.286c	1.349d	1.271c	0.092
16:0	20.90b	19.70a	24.04c	24.25c	24.11c	0.776
16:1	1.44a	1.59a	1.99b	1.96b	1.92b	0.242
18:0	9.21b	10.51c	7.88a	11.28d	11.92e	0.839
18:1	52.59c	48.72a	50.27b	49.66b	48.58a	1.281
18:2 *n-6*	11.84c	17.48d	9.51ab	9.33a	10.13b	1.073
18:3 *n-3*	0.90c	1.43d	0.32a	0.34ab	0.37b	0.077
20:1	0.89b	0.97c	0.69a	0.85b	0.70a	0.099
20:2 *n-6*	0.46c	0.55d	0.42b	0.39a	0.36a	0.050
SAFA	31.42b	28.92a	36.16c	37.16d	37.60d	1.254
MUFA	54.92d	51.00a	53.23c	52.48b	51.20a	1.368
PUFA	13.65c	20.07d	10.60ab	10.35a	11.19b	1.175
PUFA *n-3*	1.06b	1.61c	0.39a	0.41a	0.45a	0.098
PUFA*n-6*	12.40c	18.18d	10.02ab	9.81a	10.60b	1.1
Atherogenicity index	0.36b	0.33a	0.46c	0.47d	0.46cd	0.023
Thrombogenicity index	0.84b	0.72a	1.09c	1.14d	1.15d	0.059

(Different letters, within a raw, stand for significant differences, P≤0.05)

Table 1. Chemical composition of cured fat

	outdoor			indoor		RSD
	C	CxLW	C	CxLW	LW	
Moisture %	1.43	1.89	1.70	1.67	1.70	0.601
Lipid %	77.95	75.23	77.30	77.47	75.85	3.907
Fatty acid %:						
14:0	1.189b	1.106a	1.493c	1.534c	1.518c	0.098
16:0	20.52a	20.20a	23.23b	23.50b	24.30c	0.761
16:1	2.025a	2.32b	2.81d	2.57c	2.76cd	0.344
18:0	9.137b	8.307a	9.693b	10.575c	11.193c	0.911
18:1	52.20cd	49.03a	52.45d	51.69bc	51.25b	1.159
18:2 *n-6*	11.22c	15.10d	7.79b	7.91b	7.12a	0.842
18:3 *n-3*	1.116c	1.547d	0.282b	0.291b	0.214a	0.093
20:1	1.187b	0.847a	1.216b	1.051b	0.908a	0.135
20:2 *n-6*	0.530c	0.530c	0.375b	0.342b	0.261a	0.062
SAFA	31.22b	30.04a	34.74c	35.88d	37.27e	1.137
MUFA	55.41b	52.20a	56.48c	55.32b	54.91b	1.271
PUFA	13.36c	17.76d	8.78b	8.79b	7.81a	0.955
PUFA *n-3*	1.255c	1.704d	0.341b	0.339b	0.255a	0.110
PUFA*n-6*	11.82c	15.72d	8.22b	8.31b	7.41a	0.872
Atherogenicity index	0.370a	0.354a	0.450b	0.465c	0.487d	0.027
Thrombogenicity index	0.823b	0.756a	1.031c	1.086d	1.159e	0.028

(Different letters, within a raw, stand for significant differences, P≤0.05)