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Effect of pasture in oak and chestnut groves on chemical and sensorial traits of cured lard of Cinta Senese pigs

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ABSTRACT

The objective of this study was to evaluate the effect of pasture in oak and chestnut groves on the chemical and sensorial traits of cured lard. Thirty Cinta Senese barrows (124kg of l.w. on average) were allotted to three groups: one group (CONC) was reared outdoors in a confined area and fed commercial feedstuff. The other two groups were raised under free-range conditions on acorns (AC) or chestnuts (CH). At slaughtering (148kg of LW) the backfat was seasoned for 60 days to obtained cured lard. Results demonstrated that the lard of CH and AC respect to CONC group was the richest in MUFA (46.9 and 47.76 *vs* 44.78% respectively) because of the higher content of oleic acid (44.2 and 44.91 *vs* 42.05%, P<0.05, respectively). CH showed a higher percentage of PUFA-n3 than AC and CONC (1.18 *vs* 1.06 and 1.03%, P<0.05, respectively), a lower content of α-tocopherol (9.77 *vs* 14.46 and 13.31μ/g, P<0.05 respectively) and a higher content of γ-tocopherol (13.73 *vs* 6.02 and 4.32μ/g, P<0.05, respectively). As regards sensorial traits, the lard of CH and AC groups exhibited a lower value of pinkness than CONC (29.3 and 32.4 *vs* 49.2, P<0.05, respectively) and higher scores of yellowness (31.4 and 28.6 *vs* 18.6, P<0.05, respectively) and oiliness (37.0 and 33.7 *vs* 24.0, P<0.05, respectively). The pasture in the acorn and chestnut groves affected the chemical traits of lard, prevalently the composition of fatty acids . The consumption of acorns or chestnuts led to a higher content of oleic acid with respect to concentrate, affecting some sensorial traits of lard.

Key words: Fatty acids, Sensorial traits, Cured lard, Acorn, Chestnut.

RIASSUNTO

EFFETTO DEL PASCOLO SU QUERCETO E CASTAGNETO SULLE CARATTERISTICHE CHIMICHE E SENSORIALI DEL LARDO DI SUINI CINTA SENESE

Obiettivo del presente lavoro è stato quello di valutare l'effetto del pascolo in querceto e castagneto sulle caratteristiche chimiche e sensoriali del lardo stagionato di suini Cinta Senese. Allo scopo sono stati utilizzati 30 suini maschi castrati Cinta Senese di circa 124kg di PV. Gli animali sono stati suddivisi in tre gruppi

di 10 animali ciascuno: un primo gruppo (CONC) è stato allevato all'aperto in un'area recintata e alimentato esclusivamente a base di mangime commerciale, gli altri due gruppi sono stati allevati in bosco di querce (AC) o di castagni (CH). Alla macellazione, avvenuta ad un peso medio di 148kg, il grasso dorsale è stato prelevato e stagionato a secco per 60 giorni. Il lardo dei suini dei gruppi CH e AC è risultato il più ricco in MUFA (46,9 e 47,76 vs 44,78%, P<0,05, rispettivamente), a causa soprattutto del più alto tenore di acido oleico (44,2 e 44,91 vs 42,05%, P<0,05, rispettivamente). Il gruppo CH ha mostrato la più alta percentuale di PUFA-n3 rispetto ai gruppi AC e CONC (1,18 vs 1,06 e 1,03%, P<0,05, rispettivamente), il più basso contenuto di α-tocoferolo (9,77 vs 14,46 e 13,3 μ/g, P<0,05, rispettivamente) e il più alto di γ-tocoferolo (13,73 vs 6,02 e 4,32μ/g, P<0,05, rispettivamente). Per quanto riguarda le caratteristiche sensoriali i lardi dei gruppi CH e AC hanno mostrato, rispetto al gruppo CONC, i più bassi valori di rosa (29,3 e 32,4 vs 49,2, P<0,05, rispettivamente), i maggiori valori di giallo (31,4 e 28,6 vs 18,6 P<0,05) e di oleosità (37,0 e 33,7 vs 24,0, P<0,05, rispettivamente). Il pascolo in bosco sembra quindi influire sulle caratteristiche chimiche e composizionali del lardo stagionato. L'assunzione di ghianda e/o castagna comporta un aumento del livello di acido oleico e quindi un significativo effetto sulle caratteristiche sensoriali del lardo.

Parole chiave: *Acidi grassi, Caratteristiche sensoriali, Lardo stagionato, Ghianda, Castagna.*

Introduction

The Cinta Senese pig is an Italian autochthonous breed from the Tuscany region, traditionally reared in Mediterranean forests. Grazing in woods is used to various extents for Cinta Senese pigs and it makes it possible to exploit otherwise unused feed resources and to provide a product with added value. The Cinta Senese is generally reared in the Mediterranean area; this territory is more fragile and more complex in comparison with other regions, such as the Spanish Dehesa for the Iberian breed, which has already reached a stable equilibrium with swine rearing (Lopez-Bote, 1998; Franci, 2004). Moreover, in the Cinta Senese free-range area, oak plantations *(Quercus cerris, Quercus pubescens* and *Quercus ilex*) are flanked by chestnut stands (*Castanea sativa*) where production, exceeds human consumption, and can, therefore, be opportunely used for swine feeding. For many years consumers have demonstrated an increasing appreciation for the Cinta Senese products and, among them, lard is now back in vogue as a gourmet product flanking other well known Italian lards such Arnaud and Colonnata, which have been recognized by PDO (Protected Designation of Origin).

Several studies report the influence of pasture on acorns during the finishing period on the quality of muscular and adipose tissues of autochthonous pigs (Diaz *et al.*,1996; Cava *et al.*, 1997; Andrés *et al.*, 2001; Pugliese *et al.*, 2002; Pugliese *et al.*, 2004; Pugliese *et al.*, 2005a; Pugliese *et al.*, 2007c; Pugliese *et al.*, 2007a). Some studies, carried out on Iberian pigs, pointed out that fattening on oak plantations modifies fatty acid composition and can positively affect the sensorial characteristics of Iberian dry-cured products and their acceptability by consumers (Cava *et al.*, 2002; Carrapiso *et al.*, 2003). At the same time an increasing number of studies is focusing on the oxidative stability of meat and fat and how it can be affected by the fattening on an oak plantation (Rey *et al.,* 1997; Daza *et al.*, 2005).

On the contrary, the effect of pasture in chestnut groves on meat quality has been scarcely studied (Coutron-Gambotti *et al.*, 1998; Pugliese *et al.*, 2007b) and no study has been conducted to detect the differences in fat traits of pigs fed acorn or chestnut.

Thus the aim of this study was to evaluate the effect of pasture in oak or chestnut groves on some chemical characteristics and sensorial traits of cured lard.

Material and methods

Animals and diets

Thirty castrated male Cinta Senese pigs weighing about 124kg were randomly allotted to three groups (10 pigs per group) according to the type of feeding during the finish-fattening period (last 90 days prior to slaughter) from November to January, corresponding to the maximum production of acorns and chestnuts. One group (CONC) was reared in confinement (paddock of 1Ha) and it had free access to an appropriate diet (3kg/pig/d). The other two groups were raised under an extensive production system according to the traditional free-range conditions: pasture and acorns (AC) for the group reared in the oak plantation (8Ha) (*Quercus cerris* and *Quercus pubescens*); pasture and chestnuts (CH) for the group reared in the chestnut grove (8Ha) (*Castanea sativa*). Chemical composition and fatty acid composition of the experimental mixture and acorn and chestnut are shown in Table 1. The chemical analysis of feed was carried out following the methods of AOAC (1990). Before the experimental period animals were reared together under a confinement system and fed the same feedstuff. Pigs were slaughtered at a target weight of 148kg. At slaughtering the thickness of back fat was recorded separately for outer and inner layer.

Materials and technology

At slaughtering the back fat was taken to obtain cured lard. The back fat was sectioned off in blocks and salted with a curing mixture (salt and pepper). This mixture was rubbed on the lard which was kept in a cold room (4°C and RH of 80%) for a curing period of 60 days. The seasoning was conducted in a small salami factory where on-site equipment was used.

Chemical analysis

Cured lard was sampled in the lumbar region and, separately for outer and inner

Table 1. Chemical composition of feeds.

		Chestnut	Acorn	Concentrate
Moisture	%	61.04	43.0	10.60
Protein	"	3.08	3.12	16.10
Ether Extract	"	0.84	1.69	3.58
Crude Fibre	"	1.57	1.96	3.9
γ-tocopherol	mg/kg DM	43.94	41.65	11.07
α-tocopherol	"	2.21	5.16	34.17
C16:0	%	13.9	15.0	16.7
C18:1	"	37.5	46.8	19.7
C18:2	"	42.3	30.2	56.2
C18:3	"	3.9	4.0	4.5
MUFA	"	38.3	48.3	20.3
PUFA-n3	"	3.9	4.0	4.5
PUFA-n6	"	42.3	30.2	56.2

layer, was submitted to the following determinations: i) moisture in oven at 105°C until constant weight; ii) total lipids extracted according to Folch *et al.* (1957); iii) fatty acid analysis of total lipids. Fatty acid methyl esters were prepared by esterification in presence of sulphuric acid (Morrison and Smith, 1964) and were analysed by gas chromatography, using a DANI 86.10 apparatus equipped with a flame ionisation detector (FID). Fatty acids were separated on a capillary column coated with FFAP-TPA stationary phase (30m length; 0.32mm internal diameter; 0.25mm film thickness). The temperature of the column started at 160°C and reached 220°C, with 2°C/min. increase. Temperature of the detector was set at 260°C. Methyl esters were identified by their retention time and expressed as percentage of total detected methyl esters; iv) free malondialdehyde (MDA) according to the method of Pikul *et al.* (1983): 2.4g of tissue were homogenised in 4ml of BHT 0.01g/ml chloroform and 15ml TCA (5%). The homogenate was centrifuged for 15 min at 2000g at 4°C and 2 ml of the aqueous supernatant were added to 3ml TBA 0.02M. When the solution was coloured the pH was adjusted to around 7, then the solution was filtered with chromatographic cartridges to obtain the solid phase extraction (Sep-Pak Cartridges, waters Corporation, Massachusetts) and remove extraneous products. Finally a colour reading was made with spectrophotometer (PerkinElmer EZ-150) at a wavelength of 535nm. MDA content was expressed in mg/kg of total lipids; v) α and γ-tocopherol (only on outer layer) were extracted using the method described by Rey *et al.* (2006). The extract containing the tocopherols was analysed by reverse phase HPLC (HP 1100, equipped with a diodoarray detector). The solvent mixture was methanol:water (97:3) at a flow rate of 2ml/min.

Sensory analysis

The samples of cured lard were assessed by a trained panel of 12 members using a descriptive analysis method: 12 traits regarding sensory characteristics of lard, grouped in appearance, texture, taste and aroma, were studied. A 10-cm unstructured scale was used, whose extremes were "very low" and "very high". All sessions were done at 20-24°C in a panel room equipped with fluorescent lighting. Three lards were successively evaluated simultaneously assessing the three treatments per session. The samples order was randomised.

Statistical analysis

Data were analysed with the following linear model (SAS, 1996):

$Y_{ijkl}=\mu+D_i+S_{ij}+L_k+e_{ijkl}$,

where Y_{ijkl} is the l^{th} observation; μ is the overall mean; D is the i^{th} diet; S is the j^{th} subject within diet; L is the fat layer effect (for chemical composition) or the judge effect (for subjective assessment); e_{ijkl} is the residual error. The animal effect was considered the error term for the comparison among diets. Interaction among main effects was tested but it was not significant, so it was excluded from the final model. Factorial Analysis and the Varimax rotation (SAS, 1996) were applied to evaluate the relations between variables.

Results and discussion

In Table 2 the initial weight, the slaughtering weight, the average daily gain and the fat thickness are reported. No significant differences among groups were found. Consequently it is assumable that the feeding resources providing by the pasture on wood was enough to satisfy the requirements of animals. The chemical analysis and the fatty acid composition of cured lard as influenced by diet and layer are shown

Table 2. Effect of diet on initial and slaughtering weights, average daily gain and fat thickness.

		Diet			RSD
		CH	AC	CONC	
Initial weight	kg	123.1	121.6	127.6	13.06
Slaughtering weight	"	149.9	144.3	152.7	13.84
ADG	g/d	317.6	306.6	302.1	116.1
Fat thickness (mm):					
- Total		38.9	41.10	34.7	4.63
- Outer layer		17.8	18.2	16.8	1.98
- Inner layer		21.1	22.9	17.9	4.48

RSD: Residual Standard Deviation.
ADG: Average Daily Gain.

in Table 3. CH and AC groups showed a higher percentage of oleic acid (and consequently of MUFA), and lower of C18:0 (and of SFA) than the CONC group. These results can be explained by a ready incorporation into pork fat of dietary fatty acids (Fontanillas *et al.*, 1998). Indeed acorns and chestnuts are characterized by a higher content of oleic acid respect to concentrate (Table 1). The differences in MUFA percentage between AC and CONC pigs agree with findings on other autochthonous breeds, for instance on fresh fat of Nero Siciliano pigs (Pugliese *et al.*, 2004) and on cured fat of Iberian ham (Carrapiso *et al.*, 2003). Nevertheless it must be emphasised that difference in oleic acid percentage between pigs fed acorns or concentrate found in this trial, though significant, are lower than those found in Iberian pigs. Moreover, in another study on cured ham of Cinta Senese, Pugliese *et al.* (2006a) found lower MUFA percentage in the outdoor pigs than in the indoor ones. These differences in acidic composition between the two breeds are probably due to differences in growth rate. As reported by Pugliese *et al.* (2006b), in the Iberian system,during fattening on "Montanera" (traditional fattening period under oak plantation), animals show an average daily gain of about 1kg while during fattening on wood, Cinta Senese pigs have an average daily gain of about 300g. It is probable that the more intensive the growth rate, the more intensive is the accumulation of fatty acids, in particular for those of feed origin. As regards the higher MUFA percentage of CH pigs with respect to CONC, our results are in general agreement with the findings of Coutron-Gambotti *et al.* (1998) on back fat and intramuscular fat of Corsican pigs.

No differences among diets were found for total PUFA while the CH group showed the highest values of C18:3 and PUFA-n3 content confirming previous studies on Cinta Senese pigs fed chestnuts and barley (Pugliese *et al.*, 2007b, 2007c). The effect of the free-range system on PUFA content in pig fat is not so clear. In the phospholipids fraction of intramuscular fat Cava *et al.* (1997) reported higher PUFA percentage in pigs fed concentrate than in pigs raised on acorns and pasture. In Iberian hams, Car-

Table 3. Effect of diet and layer on chemical and fatty acid composition (% total fatty acids).

		Diet			Layer		RSD
		CH	AC	CONC	Outer	Inner	
Moisture	%	4.38	4.64	4.38	3.77[b]	5.16[a]	0.61
Lipids	"	78.40	78.51	78.61	78.77	78.91	2.71
C14:0		1.20	1.18	1.18	1.18	1.19	0.06
C16:0		22.00	21.96	22.51	21.00[b]	23.32[a]	0.39
C16:1		1.65	1.68	1.61	1.78[b]	1.51[a]	0.07
C16:3		0.32	0.32	0.36	0.40[b]	0.27[a]	0.02
C17:0		0.39[a]	0.39[a]	0.47[b]	0.43[b]	0.40[a]	0.03
C18:0		11.39[a]	11.35[a]	12.50[b]	10.15[b]	13.35[a]	0.47
C18:1		44.20[a]	44.91[a]	42.05[b]	44.82[b]	42.63[a]	0.64
C18:2		15.60	14.93	16.11	16.84[b]	14.26[a]	0.70
C18:3		1.03[a]	0.93[b]	0.91[b]	1.03[b]	0.88[a]	0.09
C20:1		1.04[a]	1.16[b]	1.12[ab]	1.10	1.11	0.07
C20:2		0.81	0.82	0.84	0.92[b]	0.73[a]	0.10
C20:3		0.15	0.13	0.13	0.18[b]	0.09[a]	0.02
C20:4		0.07[a]	0.03[b]	0.04[ab]	0.07[b]	0.02[a]	0.03
SFA		35.14[a]	35.07[a]	36.90[b]	32.93[b]	38.48[a]	0.76
MUFA		46.90[a]	47.76[a]	44.78[b]	47.71[b]	45.25[a]	0.69
PUFA		17.99	17.16	18.41	19.45[b]	16.26[a]	0.80
PUFA-n3		1.18[a]	1.06[b]	1.03[b]	1.21[b]	0.98[a]	0.10
PUFA-n6		16.49	15.78	17.00	17.84[b]	15.01[a]	0.73
n6/n3		14.07[a]	14.98[a]	16.63[b]	14.89	15.56	1.57
α-tocopherol	µg/g	9.77[a]	14.46[b]	13.31[b]			4.27
γ-tocopherol	"	13.73[b]	6.02[a]	4.32[a]			2.09
TBARS	mg MAD/kg	0.58	0.80	0.70	0.74	0.65	0.18

[a, b]*within criterion means different (P<0.05).*

rapiso *et al.* (2003), reported significant effect of rearing system only on C18:3, which was higher in indoor than in outdoor pigs. On adipose tissue of Corsican pigs, Coutron-Gambotti *et al.* (1998), found higher content of both PUFA n-3 and PUFA n-6 in animals fed chestnuts with respect to those fed concentrate. It is possible that the different intake of grass, which is an important source of PUFA, can be varied during pasture according to availability of the wood.

As regards the layer effect, the outer-layer showed lower SFA percentage and

the higher MUFA and PUFA contents with respect to inner layer. In particular the linoleic acid percentage was much higher in the outer layer. These results are in total accordance with Monziols *et al*. (2007) who found the same results on the two layers of subcutaneous fat taken from loin. As reported by these Authors, the metabolic causes behind the preferential deposition of polyunsaturated fatty acids in the outer layer are not fully understood. It is probable that the inner layer of subcutaneous adipose tissue exhibits larger *de novo* lipogenesis, consequently the polyunsaturated fatty acids of feed origin (particularly C18:2) are diluted with more endogenous fatty acids than in the outer layer (Koch *et al*., 1968; Christie *et al*., 1972; Geri *et al.,* 1988).

The concentrations of α-tocopherol and γ-tocopherol are shown in Table 3. CH pigs showed the lowest values of α-tocopherol and the highest of γ-tocopherol. In literature, as far as we are aware, there is a lack of information regarding the tocopherol content in chestnuts and its effect on fat quality, but the interest in vitamin E compounds in vegetable oils and nuts is growing. Amaral *et al.* (2005) reported that, although research has demonstrated a higher antioxidant activity of α-tocopherol with respect to other compounds, in recent years many studies are also focusing on the biological activities and health effects of the γ-tocopherol. Moreover, several studies have been carried out on the effect of pasture on oak plantations on the tocopherol level in meat products. Daza *et al.* (2005), reported a higher content of both α and γ-tocopherol in the muscle of pigs reared on oak plantations with respect to pigs reared in confinement and fed commercial diets. Rey *et al.* (1997), reported a higher level of α-tocopherol in *Longissimus dorsi* muscle and in the microsome extract of pigs fed pasture and acorns with respect to pigs fed concentrate with a basal level of α-tocopheryl acetate (l0mg/kg), but lower with respect to pigs fed a diet containing a supplemented level of α-tocopheryl acetate (100mg/kg).

No differences among diets were found in TBARS of seasoned lard (Table 3), moreover the level of this compound is very scarce; this confirms the positive effect of pasture on wood on the oxidative stability of pig products pointed out by several studies: Rey *et al.* (1997) reported a lower oxidation rate of membrane extracts from pigs fed extensively compared with those fed diets containing supplemented level of α-tocopheryl acetate, assuming that dietary constituents unlike α-tocopherol, and/or some antioxidant enzymes, might also play a protective role. In light of the results of the present trial and with those of other recent findings (Daza *et al.*, 2005), it is probable that also γ-tocopherol plays an important role in oxidative stability of products.

As regard sensorial analysis (Table 4), significant differences among feeding systems were found on colour of fat: CH and AC pigs showed the lowest values of pinkness and the highest of yellowness. Colour is an important property of cured lard which contributes to its acceptability but, unfortunately, there is a lack of information about colorimetric characteristics of this product. However, it is probable that the pasture on wood, and the consequent intake of grass, contributed to increase the yellowness of fat. Dunne *et al.* (2006), reported that the intake of the carotenoid pigments due to green forage consumption results in a more yellow subcutaneous fat also in heifers. Otherwise, Carrapiso *et al.* (2003) showed the value of fat pinkness higher in Iberian hams of free-range animals fed acorns with respect the indoor ones and no effect of rearing system on yellowness.

Table 4. Effect of diet on sensory characteristics of lard.

	Diet			RSD
	CH	AC	CONC	
Appearance:				
Pinkness	29.35[a]	32.40[a]	49.20[b]	11.1
Yellowness	31.38[a]	28.60[a]	18.59[b]	12.9
Oiliness	36.98[a]	33.75[a]	24.00[b]	12.1
Texture:				
Firmness	45.36	46.14	51.28	13.7
Hardness	26.88[a]	38.92[b]	31.23[ab]	14.3
Juiciness	52.60	48.76	49.74	13.5
Fibrousness	29.31	36.29	28.00	17.5
Aroma:				
Odour intensity	46.50	48.72	48.64	13.5
Taste:				
Saltiness	31.13	37.04	34.13	14.1
Flavour:				
Rancid	8.24	6.01	9.68	8.03
After-taste	4.65	4.53	6.40	7.12
Persistence	43.10	43.30	42.99	12.7
Overall acceptability	49.54	49.68	46.07	14.5

[a, b]within criterion means different (P<0.05).

As far oiliness trait is concerned, CH and AC pigs showed the highest values which could be related to their larger MUFA content, confirming the positive correlation found between the two parameters (Carrapiso *et al.*, 2003; Pugliese *et al.*, 2005b), but disagreeing with Davenel *et al.*, (1999), who found little influence of monounsaturated level on solid fat content of adipose tissue.

Among texture characteristics hardness was significantly affected by rearing system with CH pigs that exhibited the lowest value. It is known that fatty acids are involved in various technological aspects of meat quality because of their different melting point (Wood *et al.*, 2003), so the higher level of MUFA and PUFA n-3 of CH pigs could have negatively affected the hardness of their fat. Aroma, taste and flavour parameters were not influenced by diet. It is probable that the short period of curing (two months) is not able to induce significant differences in the overall aroma of lard. Indeed, as reported by Toldrà (1998) for dry cured hams, the generation of the main volatile compounds occurs especially in the latest stage of the process. Finally, as regards overall acceptability, it is important to emphasis that, as reported by Cilla *et al.* (2005), the practice of using a small trained panel to make affective judgements in addition to rating intensity of attributes, is

Table 5. Factor loadings for each variable on the rotated components.

		Factor 1	Factor 2	Factor 3
Variance explained	%	25.28	17.74	15.34
Variable:				
Pinkness		0.34	-0.39	0.09
Yellowness		**-0.45**	**0.50**	**0.42**
Oiliness		-0.02	**0.68**	-0.05
Firmness		-0.12	**-0.68**	0.29
Hardness		0.13	0.01	**0.90**
Juiciness		**0.57**	0.37	**-0.45**
Fibrousness		-0.06	0.13	**0.90**
Odour intensity		**0.67**	-0.24	0.28
Saltiness		**0.85**	0.06	0.05
Rancid		**-0.58**	-0.24	0.35
After-taste		**-0.44**	-0.29	**0.41**
Persistence		**0.69**	0.13	-0.06
MUFA		0.30	**0.78**	0.14
PUFA		-0.11	**-0.63**	-0.18

A variables were considered to compose a factor when scores were greater than 0.4 (in bold).

fairly common; nevertheless sensory analysis scientists generally assert that effective data on overall acceptability should be obtained by subjects selected to represent the population of consumers. However, for this parameter the trained panel did not find any significant differences but, apart from the statistical effect, the absolute values of acceptability of CH and AC were higher than CONC pigs.

The picture resulting from the overview of the results of sensorial analysis is more articulate: the data on appearance parameters could lead to suppose that the pasture in acorn or chestnut woods negatively affects the satisfactoriness of cured lard. In fact, it is well known that in the markets of Southern Europe, Italian particularly, yellow and oily lard is little accepted by consumers. But, on the other hand, the higher values of overall acceptability and the lower value of rancidity of CH and AC found in this trial (not different with respect to CONC pigs), could lead toward a positive characterization of cured lard, and in general of cured products, derived from free ranged pigs. This contradiction suggests the abandoning of prejudices towards some quality traits of cured products.

Results of factorial analysis are shown in Table 5. Variables included in the first factor were significantly and closely correlated (Pearson correlation coefficients greater than 0.4). In particular, it seems that the Factor 1 joined the variables related to the taste and aroma traits (juiciness, odour intensity, saltiness, rancid, after-taste, persistence); Factor 2 joined the variables

related to consistency traits (oiliness, firmness, MUFA, PUFA); Factor 3 joined the variables related with the textural traits (hardness, juiciness, fibrousness).

Conclusions

The characterization of dry cured products of Cinta Senese breed seems to be closely linked to the animal rearing system. The results of the present trial leads one to believe that the pasture on wood affected the chemical traits of lard, fatty acids composition prevalently. The consumption of acorns or chestnuts led to a higher content of oleic acid with respect to concentrate, affecting some sensorial traits of lard. The main sensorial parameters influenced by rearing system were those classified as "appearance" which showed values that, from an Italian consumer's point of view, are negatively considered. In fact a more yellow and oily lard is not accepted by consumers even if these characteristics are not necessarily associated with a bad taste, as the present results confirm. In conclusion, a change in some consumer's prejudice is necessary to assure this product of a seasonable collocation on the market.

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