EFFECT OF DESALTING AND COOKING ON CHEMICAL COMPOSITION OF "LACÓN GALLEGO" (DRY-CURED PORK FORELEG).

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Background

Dry cured pork foreleg "Lacón Gallego" is a typical product manufactured in the northwest of Spain where it has a great economical importance. In 2001, Protected Geographical Indication (PGI) "Lacón Gallego" was recognised in European Union (Commission of the European Communities, 2001). Its elaboration is begun cutting the fore extremity of the pig at the shoulder blade-humerus joint. Processing involves a series of phases: salting, washing, standing and drying or curing in a minimum of thirty days (approximately 35 days). The final product is normally eaten after desalting and cooking (boiling). The existing information in scientific literature related to "Lacón Gallego" is very scarce and it is only related to biochemical characteristics of dry-cured forelegs (Marra et al, 1999), changes in chemical composition during dry-cured pork fore extremity processing (Cobos et al, 2001) or microbiological changes during the manufacture of dry cured lacón (Vilar et al, 2000). However, there are no studies about changes in chemical composition of "Lacón Gallego" after desalting and cooking.

Objectives

The objective of this work was to study the effect of desalting and cooking on chemical composition and physico-chemical aspects of dry-cured foreleg protected by PGI.

Methods

Ten crossbred pigs were fattened and slaughtered controlled by PGI Council inspectors. Ten fore extremities were removed from these carcasses post-slaughter at the shoulder blade-humerus joint. The raw pieces (about 4 kg. each one) were rubbed with salt, containing about 0.1% potassium nitrate, and placed in piles of salt at low temperature (2-5ºC) and high relative humidity (80-90%) for 5 days. After washing to remove salt from the surface, the pieces were hung in a post-salting room at 2-5ºC and relative humidity of 85% for 15 days. Once the post-salting stage had finished, the pieces were transferred to a drying-ripening room at 12ºC and 60% of relative humidity during 15 days. Five dry-cured forelegs were removed for testing at the end of the processing. The samples were taken from 2 different zones of the foreleg, representing external or superficial muscles (*m. pectoralis profundus, m. serratus ventralis, m. supraspinatus* and *m. subscapularis*) and internal or deep muscles (*caput lateral mi. tricipitis brachii, caput longum mi. tricipitis brachii, m. infraspinatus and m. deltoideus*). Samples were vacuum packaged and kept at -20ºC until analysed.

The other five dry-cured forelegs were desalted in water during 48 hours. Afterwards, the desalted forelegs were cooked in boiling water during 60 minutes. The samples were also taken from 2 different zones of the foreleg, representing external and internal muscles as described in dry-cured forelegs.

The meat obtained (from each foreleg) was finely minced in a blender (Polytron PT 10-35). NaCl (Carpentier-Volhard method) and nitrate (brucine method) were determined following the Spanish official standards (Presidencia del Gobierno, 1979). The pH was determined introducing a penetration pH electrode in the sample and the measurement was carried out by triplicate with a pH meter GLP 21 (Crison Instruments, S.A., Barcelona, Spain). Water activity (a_w) was measured by duplicate with a Aqualab CX-2 Water Activity System apparatus (Decagon Devices, Pullman, WA). AOAC methods (1995) were used for the nitrites (colorimetric method), dry matter, protein and ash determination. Lipids were extracted and purified from the former homogenate according to the method described by Hanson and Olley (1963). Total lipids were gravimetrically determined. The cholesterol content was determined by an enzymatic method using the laboratory kit from Sigma Diagnostics. The extent of lipid oxidation was assessed by the thiobarbituric acid (TBA) method described by Pikul et al. (1983).

Statistical treatment was performed by using Student´s t-test for comparison between means of dry-cured foreleg and cooked dry-cured foreleg for external and internal muscles (SPSS version 9.0.1. for Windows, 1998).

Results and discussion

The chemical composition and physico-chemical parameters of dry-cured and cooked pork forelegs are shown in Table 1. The average dry matter values in dry-cured forelegs were lower than those found by other researchers in dry cured lacón (Marra et al, 1999). This circumstance could be explained by the fact that, in PGI "Lacón Gallego", the drying-ripening period (15 days) is lower than the other study (90 days). The mean values of NaCl and pH were lower and nitrates higher than those reported by Marra et al (1999).

The values of dry matter for internal muscles were higher in cooked dry-cured forelegs than in dry-cured forelegs whereas for external muscles, the dry matter values were lower in cooked dry-cured forelegs than in dry-cured forelegs. The ash contents were lower in cooked than in dry-cured forelegs for both external and internal muscles. The chloride contents decreased after desalting and cooking the pieces whereas the nitrates and nitrites contents only decreased in the external muscles. Sodium chloride losses in desalting and boiling water were probably responsible of the decrease of ash content in cooked samples.

No significant differences ($p>0.05$) were observed between dry-cured forelegs and cooked dry-cured forelegs for cholesterol content and TBA values. The cholesterol content of forelegs was close to those obtained for Spanish commercial pork cuts (Dorado et al, 1999).
Finally, cooked dry-cured forelegs showed higher mean values in pH and water activity than the dry-cured forelegs although pH increased only significantly on internal muscles whereas water activity only increased significantly in external muscles. The increase in pH has been observed in other cooked meats (Dal Bosco et al, 2001).

Conclusions

Internal and external muscles were influenced in a different way by desalting-cooking treatment: the values of dry matter were increased in internal and decreased in external muscles. In both type of muscles, it was observed a decrease in ash (more important in external muscles) and NaCl and an increase in pH and water activity.

Pertinent literature

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Table 1 . Chemical composition and physico-chemical parameters (mean ± S.D.) of internal and external muscles from dry-cured foreleg (n=5) and cooked dry-cured foreleg (n=5)

	Internal muscles			External muscles		
	Dry-cured foreleg	Cooked foreleg	P	Dry-cured foreleg	Cooked foreleg	P
Dry matter	39.92 ± 2.93	46.93 ± 0.90	**	49.30 ± 3.62	42.75 ± 1.44	**
Ash (wet matter %)	10.19 ± 1.15	7.30 ± 0.35	**	10.76 ± 1.62	3.45 ± 0.28	***
Ash (dry matter %)	25.48 ± 1.23	15.55 ± 0.58	***	22.02 ± 4.37	8.08 ± 0.78	**
Fat (wet matter %)	5.02 ± 1.60	8.60 ± 1.44	**	6.82 ± 0.80	9.56 ± 2.05	n.s.
Fat (dry matter %)	12.66 ± 4.30	18.29 ± 2.85	*	16.98 ± 7.73	22.06 ± 4.03	n.s.
Protein (wet matter %)	24.61 ± 2.66	30.93 ± 0.96	**	31.62 ± 4.00	29.64 ± 0.76	n.s.
Protein (dry matter %)	61.60 ± 4.17	65.94 ± 2.62	n.s.	63.96 ± 3.69	69.42 ± 3.57	*
NaCl (wet matter %)	4.24 ± 0.87	3.22 ± 0.93	n.s.	5.05 ± 0.93	2.37 ± 1.13	**
NaCl (dry matter %)	10.65 ± 2.34	6.86 ± 1.95	*	10.34 ± 2.40	4.86 ± 1.76	**
Nitrates (ppm)	70.10 ± 23.60	76.88 ± 25.06	n.s.	106.01 ± 30.24	62.38 ± 18.94	*
Nitrites (ppm)	7.10 ± 5.10	7.39 ± 4.70	n.s.	17.08 ± 9.05	9.41 ± 10.06	n.s.
Cholesterol (fat %)	0.96 ± 0.36	0.76 ± 0.26	n.s.	0.86 ± 0.28	0.67 ± 0.18	n.s.
TBA (mg MDA/g fat)	71.18 ± 25.28	97.46 ± 4.86	n.s.	85.04 ± 20.70	89.49 ± 18.82	n.s.
pH	5.89 ± 0.08	6.31 ± 0.21	**	6.13 ± 0.23	6.31 ± 0.16	n.s.
aw	0.89 ± 0.01	0.91 ± 0.01	n.s.	0.86 ± 0.01	0.96 ± 0.01	***

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

MDA: Malonaldehyde