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in

De Pedro E.J. (ed.), Cabezas A.B. (ed.).
7th International Symposium on the Mediterranean Pig

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 101

2012
pages 453-456

Manufactured of "chanfaina", from Celta pig breed. Study of shelf life vacuum packaging

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Abstract. *Chanfaina* is a dry-fermented sausage abundantly produced and consumed in Galicia (NW Spain) elaborated from Celta pig breed. Traditionally, this product is distributed and sold without packaging in the local market. To extend its shelf life and expand the market, some manufacturers have begun to implement vacuum packaging. Total viable count (TVC), psychrotrophs, lactic acid bacteria (LAB), pseudomonas, enterobacteria, moulds and yeasts, *Staphylococcus aureus*, sulfite reducing clostridia, pH and TBAR´S value were analysed during storage at 4 ℃ . Sulfite-reducing clostridia and enterobacteria were not detected in any sample. Psychrotrophs were the predominant microorganisms reaching a population higher than 8.9 log cfu/g after 60 days of storage. At the same time, LAB becomes the predominant species during storage. The rest of the microbiota did not grow during storage. On the other hand, a lightly increase in pH was noticed during storage. Samples stored in vacuum package remained stable during the whole display period and no significant differences (P<0.05) were observed in TBAR´S values.

Keywords: *Chanfaina* – Celta pig breed – Vacuum packaging – Dry-fermented sausages.

Élaboration de "chanfaina" à partir de porc Celta. Étude de la vie utile après emballage sous vide

Résumé. *La Chanfaina est une saucisse sèche produite à partir de porc Celta en Galice (nord-ouest de l'Espagne) où elle y est hautement consommée. Ce produit est traditionnellement distribué et vendu sans emballage dans les marchés locaux. Dans le but d'accroître sa vie utile et d'élargir son rayon de vente, certains fabricants ont commencé à mettre en œuvre un emballage sous vide. Les comptages de mésophiles aérobies totaux, psychrotrophes, bactéries acido-lactiques, pseudomonas, entérobactéries, moisissures et levures,* Staphylococcus aureus*, clostridia sulfito-réducteurs, pH et TBAR´S, ont été déterminés durant la conservation à 4ºC. Aucune trace de clostridia sulfito-réducteurs et d'entérobactéries n'a pu être observée au sein des échantillons. Les micro-organismes prédominants furent les psychrotrophes, avec des valeurs atteignant 8,8 log ufc/g après 60 jours de conservation. Dans le même temps, LAB est apparue comme l'espèce majeure formée durant la conservation. Une légère augmentation du pH fut également observée. Les échantillons conservés sous vide sont demeurés stables durant toute l'étape de conservation et aucune variation significative des valeurs de TBAR'S (P < 0,05) n'a pu être mise en évidence.*

Mots-clés. *Chanfaina – Porc Celta – Emballage sous vide – Saucisse sèche.*

I – Introduction

The Celta was the typical breed of pig raised on farms in Galicia (northwest Spain) until the middle of the 20th century, at which time it suffered an important recession in members due to the introduction of improved breeds and their crossbreds. This breed is highly appreciated by consumers because of the succulent meat that results from the profuse infiltration of fat into the lean meat (Franco *et al.,* 2006).

"Chanfaina" is a fermented and dried-ripened sausage abundantly produced from raw Celta pork in Galicia (NW of Spain). For the manufacture of chanfaina, low-quality pork (lean, bacon, lung, heart, jowls) is minced and salt, sweet and spicy paprika, garlic and onion are added. The

resulting mass is left standing for at least 24 h and then, it is stuffed into pork rectum tripe in units of 20-25 cm length. After stuffing, it undergoes a smoking-heating process for 8-10 days and then a drying-ripening process for 15 days.

Oxidation of the lipid fraction is one of the major causes of quality decrease during the shelf-life of sausages. The extent of the overall lipid degradation process may be affected by various factors related to: (i) the storage conditions (García-Esteban *et al.,* 2004; Papadima, and Bloukas, 1999; Zanardi *et al.,* 2002); (ii) the processing technology (Gray *et al*., 1996; Salgado *et al.,* 2005); (iii) the additives used in the dough formulation (Kanner, 1994; Skibsted, 1992); and (iv) the polyunsaturated fatty acids content of the lipid fraction.

The aim of this study was to evaluate the microbial changes of chanfaina from Celta pigs during refrigerated storage as assessed by lipid oxidation.

II – Materials and methods

1. Samples

Twenty units of chanfaina were manufactured by Porco Celta Fonsagrada, SL following the procedure described in introduction section. Samples were vacuum packed prior to thermal treatment (100ºC/15 min). After the samples were allowed to cool at room temperature, they were stored in the dark at 4ºC for 180 days.

2. Microbial analyses

In each chanfaina unit, after aseptically removing and discarding the outer plastic, 10 g of the product were aseptically taken and homogenized with 90 ml of sterile 0.1% peptone water also containing 0.85% NaCl and 1% Tween 80 as emulsifier, at 40-45 ºC for 2 min in a Masticator blender (IUL Instruments, Barcelona, Spain), thus making a 1/10 dilution. Successive decimal dilutions were prepared by mixing 1 ml of the previous dilution with 9 ml sterile 0.1% peptone water.

Phychrotroph microflora was enumerated in Standard Plate Count Agar (PCA) agar (Merck), after incubation at 7ºC for 10 d; *Enterobacteriaceae* in violet red bile dextrose (VRBD) agar (Merck) after incubation at 37ºC for 24 h; *Staphylococcus aureus* in Baird Parker agar (Merck) + Egg Yolk Tellurite Emulsion (Biokar Diagnostics) incubated at 37ºC for 24 h and Sulfite reducing clostridia in Perfringens Selective Agar (SPS) agar (Merck) after incubation at 44ºC for 24 h. Presence or absence of *Salmonella* was investigated by Enzyme Linked Fluorescent Assay (ELFA), VIDAS®-SLM protocol was carried out according to the procedures recommended by the manufacturer. From each sample and on each culture medium, 1 ml of each dilution was inoculated in duplicate on plates and mixed before solidification. Plates of VRBD agar were covered with a layer of the same culture medium before incubation. After incubation, plates with 30-300 colonies were counted.

3. pH measurement

pH was measured by blending 25 g of product with 225 ml of distilled water for 2 min. A digital pH-meter (Hanna HI 99163, Spain) was used for the measurement.

4. Measurement of TBARs

Lipid stability was evaluated in the steaks using a small 2 g portion. Lipid oxidation, measured by aldehydes generated in the process of polyunsaturated fatty acid oxidation, was determined by measuring 2-thiobarbituric acid reactive substances (TBARs) using the method proposed by Vyncke (1975) with the modification that samples were incubated at 96ºC in a forced oven. Results are expressed as (mg malonaldehyde / kg of fresh meat).

III – Results and discussion

1. Microbial characteristics

TVC, psychrotrophs, LAB, moulds and yeasts and pseudomonads are showed in Fig 1. Sulfite-reducing clostridia and enterobacteria were not detected in any of the samples analysed. The aerobic mesophilic bacteria, psychrotrophs and lactic acid bacteria counts were over 6.4, 7.8 and 8.1 log cfu/g, respectively immediately after packaging, while pseudomonads and moulds and yeasts were below over 3 log cfu/g.

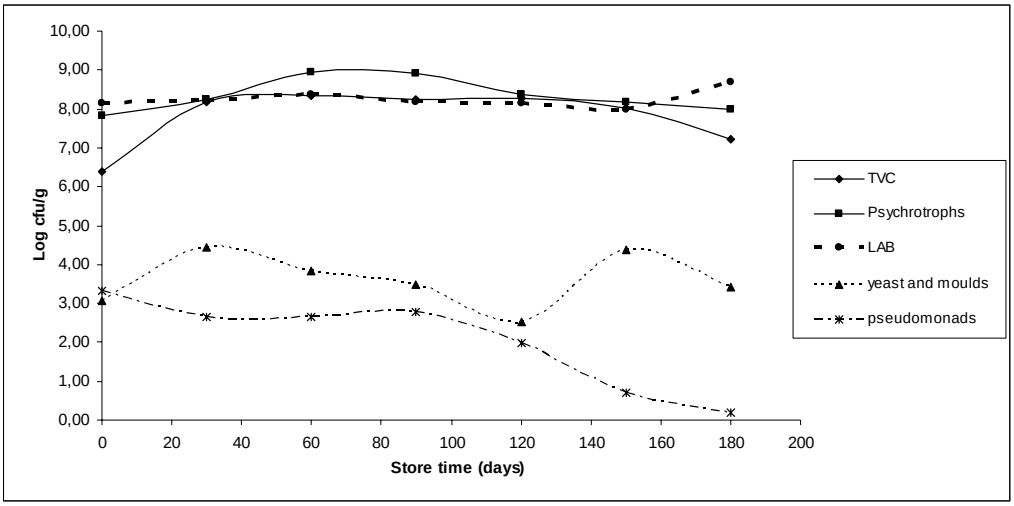

Fig. 1. Evolution of TVC, psychrotrophs, LAB, moulds and yeasts and pseudomonads in chanfaina from Celta pigs under refrigerated storage. Means with different letter in the figure show significant differences (P<0.05; Duncan test) for the effect store time.

2. pH changes

Initial pH values were below 5 for all samples analysed (Fig. 2). A non-significant increase (P>0.05) was observed during all the period of storage. However, it can show a lightly increased in pH values under refrigerated storage reached a mean final pH value of 5.18.

3. Lipid stability

The level of lipid oxidation of chanfaina was estimated on base of the amount of 2-thiobarbituric acid reactive substances (TBAR´s values) (Fig. 2). All samples started with low values of about 0.4 mg MDA/kg in fresh meat. Exclusion of the oxygen content in the vacuum package limited oxidation and thus resulted in lower TBAR´s values for these *chanfaina* samples. Samples stored in vacuum package remained stable during the whole display period and no significant differences (P<0.05) were observed. This outcome was not surprising, as the meat storage conditions during the display period in a vacuum environment protect the meat from oxygen.

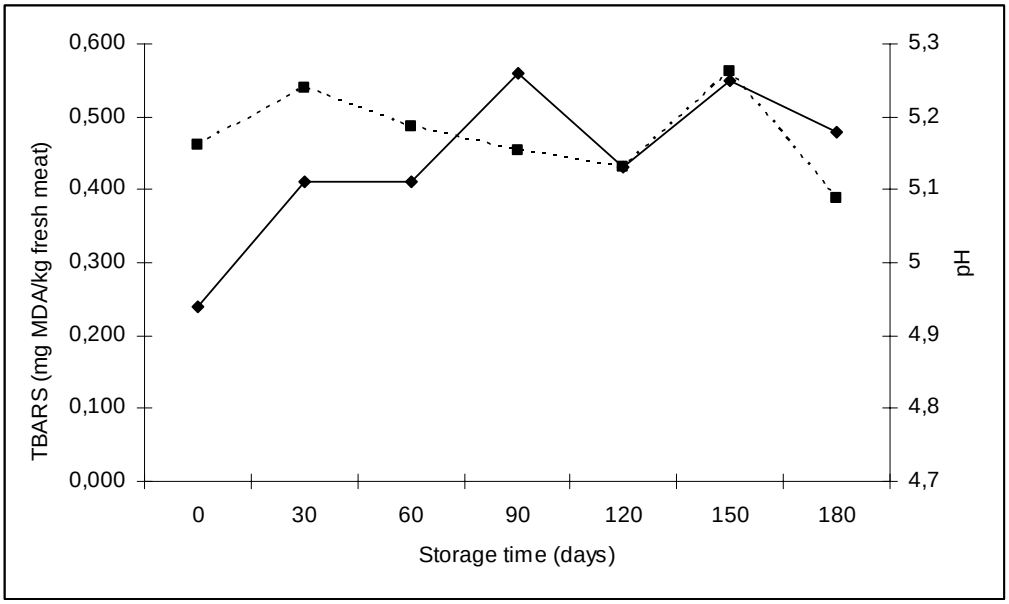

Fig. 2. Evolution of pH and TBAR´S values in chanfaina from Celta pigs under refrigerated storage.

Acknowledgements

Authors are grateful to FEADER (Project 2008-15) for the financial support. Special thanks to Porco Celta Fonsagrada, S.L. for chanfaina from Celta pig samples supplied for this research.

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