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Manufactured of "Mestura cocida" from Celta pig breed. Study of shelf life vacuum packaging

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Abstract. *"Mestura cocida"* is a typical product manufacture and consumed in Galicia (NW Spain) elaborated with dry-cured "lacón", "Galician chorizo" and salted head from Celta pig breed. The elaboration process is strictly controlled to achieve a satisfactory shelf life, so a high quality finally-consumed product is obtained. Physical, chemical, enzymic and microbiological test are performed to ensure this quality. Psychrotrophs, Enterobacteriaceae, *Staphylococcus aureus*, *Salmonella*, sulfite reducing clostridia and TBAR´S value were analysed during storage at 4ºC. Psychrotrophs and Enterobacteriaceae showed a increase during storage observed final values 7.88 and 5.12 log cfu/g, respectively after 90 days of storage. *Staphylococcus aureus* and *Salmonella* have not been found in any samples. On the other hand, TBAR´S values increased) during the whole display period reaching a final values of 11.8 mg malonaldehyde / kg of "Mestura cocida".

Keywords. Mestura cocida – Celta pig breed – Vacuum packaging.

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

Résumé. *La "Mestura cocida" est un produit typique produit et consommé en Galice (nord-ouest de l'Espagne) qui est fabriqué à partir de "lacón", de "chorizo galicien" et de tête de porc Celta salée. Afin d'établir la vie utile d'une denrée alimentaire et de s'assurer de sa qualité finale, il existe diverses mesures de type physique, chimique, enzymatique et microbiologique. Les comptages de psychrotrophes, entérobactéries,* Staphylococcus aureus*,* Salmonella*, clostridia sulfito-réducteurs et les valeurs de TBAR´S, ont été déterminés durant la conservation à 4 ºC. Après 90 jours d'exposition, une augmentation de psychrotrophes et d'entérobactéries fut observée durant le temps de vie utile, atteignant respectivement des valeurs de 7,88 et 5,12 log ufc/g. Aucune trace de* Staphylococcus aureus *et de* Salmonella *n'a pu être détectée au sein des échantillons. Par ailleurs, une croissance importante des valeurs de TBAR´S fut également observée au cours de la période de conservation, pour atteindre des valeurs finales de 11,8 malonaldéhyde/kg de mestura cocida.*

Mots-clés. *Mestura cocida – Porc Celta – Emballage sous vide.*

I – Introduction

"Mestura cocida" is a typical product manufacture and consumed in Galicia (Nw Spain) elaborated mainly with dry-cured "lacón", "Galician chorizo" and salted head from Celta pig breed. Dry cured lacón and Galician chorizo are traditional raw-cured meat products made in the northwest of Spain. Dry-cured lacón is elaborated from the foreleg of the pig, using similar manufacturing processes to those used in the production of dry-cured ham, Galician chorizo can be defined as the mixture of minced pork and pork fat, adition of salt, paprika, other spices and additives, mixed and inserted into natural or artificial casings, which undergo a drying-ripening process. The Celta was the typical breed of pig raised on farms in Galicia until the middle of the 20th century. This breed is highly appreciated by consumers because of the succulent meat that results from the profuse infiltration of fat into the lean meat.

The elaboration process of this product is controlled to achieve a satisfactory shelf life, so a high quality finally consumed product is obtained. This product is subjected to a pasteurisation process and vacuum-packaging. For this reason these cooked meat products are often post-contaminated because of a packaging and/or slicing step after pasteurisation process. After cooking, the normal flora of the product, is too low to protect the products against the growth of Gram-negative microorganisms (Kotzekidou and Bloukas, 1996). The bacterial flora is gradually selected towards a CO_2-tolerant but a slowly growing one (Borch *et al*., 1996). Psychrotrophic lactic acid bacteria are responsible for the spoilage of cooked meat products packed in oxygen-free atmospheres (Debevere, 1989; Borch *et al*., 1996). Enterobacteriaceae, *Staphylococcus aureus*, *Salmonella* and sulfite reducing clostridia are indicative microorganisms of the hygienic quality of the product and their count can give us an idea from the possible later contamination to the thermal treatment as well as of the effectiveness of the same one.

Oxidation of the lipid fraction is one of the major causes of quality decrease during the shelf life of mestura cocida. In particular, the deterioration involves modifications of the organoleptic characteristics, the development of unpleasant odours and tastes and a decrease in the nutritional value of the product due to a lowering of the polyunsaturated fatty acid content, whose beneficial effect on consumers health is well-known (Alexander, 1978; Rose and Connolly, 1999; Berra *et al*., 2005). Although vacuum packaging can protect meat from contamination and increase the shelf life of the product, tha anaerobic conditions may affect the quality. Many studies have revealed a change in the prevailing microflora in vacuum-packed meat products compared to that prevailing before storage (Björkroth *et al*., 1998; Samelis *et al*., 2000). This microbiological change could result in some modifications of the sensory properties and it could affect the nutritional value and the chemical compositions of products.

The purpose of the present work was, to assess the quality, during of shelf life, of vacuum-packaging mestura cocida elaborated from Celta pig breed. Physical, chemical and microbiological test are performed to ensure this quality.

II – Material and methods

1. Samples

Fifteen units of mestura cocida were manufactured by Porco Celta Fonsagrada, SL. For the manufacture of this product muscles and adipose tissues from Celta pigs were used (40% dry-cured "lacón", 40% salted head and 20% "Galician chorizo"). Samples were vacuum packed prior to thermal treatment (80 ºC/30 min). After the samples were cooled at room temperature, and stored at 4 ℃ for 90 days from the day of the manufacture (day 0). "Mestura cocida" samples were analysed at days 0, 30, 45, 60, 75 and 90 for lipid oxidation and microbial counts. In every sample point two units of "mestura cocida" were analyzed.

2. Microbiological analysis

In each mestura cocida 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℃ 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 7℃ for 10 d; *Enterobacteriaceae* in violet red bile dextrose (VRBD) agar (Merck) after incubation at 37℃ for 24 h; *Staphylococcus aureus* in Baird Parker agar (Merck) + Egg Yolk Tellurite Emulsion (Biokar Diagnostics) incubated at 37℃ 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. TBAR´s determination

Lipid stability was evaluated in the "Mestura cocida" using the method proposed by Vyncke (1975) with the modification that samples were incubated at 96 ºC in a forced oven (Memmert UFP600, Germany, Schawabach). Results are expressed as (mg malonaldehyde / kg of mestura cocida).

III – Results and discussion

Figure 1 shows the evolution of microbial counts in the mestura cocida during the shelf life vacuum packaging. Psychrotrophs bacterias and Enterobacteriaceae showed a increase during storage at 4ºC observed final values of 7.88 and 5.12 log cfu/g, respectively after 90 days of storage.

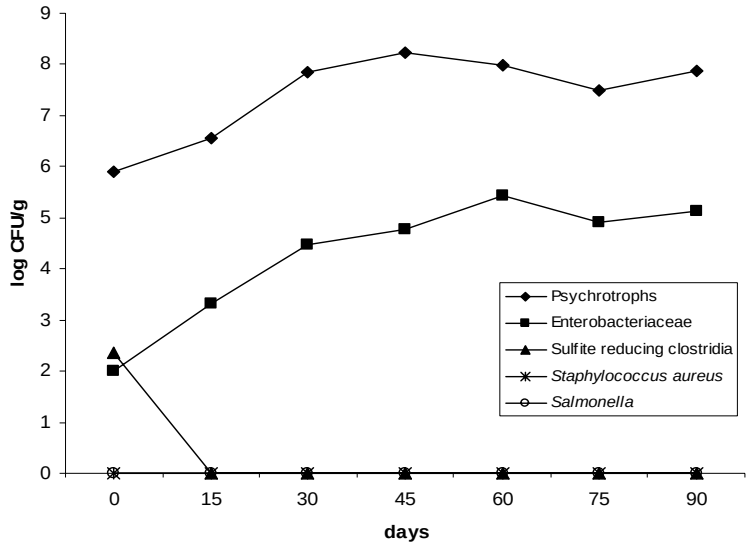

Fig. 1. Changes in log counts of the spoilage microflora in the mestura cocida under vacuum-packaging at 4ºC.

In general, mestura cocida samples showed high counts of Enterobacteriaceae and psychrotrophs bacterias. The Enterobacteriaceae populations indicate the hygienic quality of the product, and their presence can be related to contamination of faecal origin and high counts indicate poor hygienic practices or high contamination of the raw materials used in their manufacture.

Sulfite reducing clostridia only was found in the control sample. This fact could be related with the effectiveness of the thermal treatment. *Staphylococcus aureus* and *Salmonella* have not been found in any samples.

Figure 2 shows the development of lipid oxidation in the mestura cocida during the shelf life vacuum packaging. TBAR`S values increased during the whole display period reaching a final values of 11.8 mg malonaldehyde / kg of mestura cocida. Duration of display period affected the overall TBARS formation of the mestura cocida. The amounts of TBARS formed in the course of storage were higher the critical value of 3 mg/kg at which rancidity is detected (Wong *et al*., 1995).

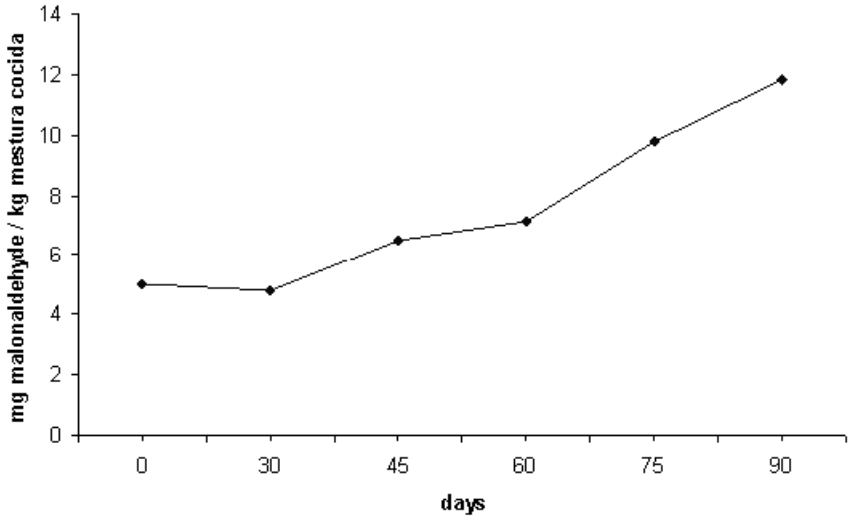

Fig. 2. Changes in TBAR's values in the mestura cocida during shelf life vacuum-packaging at 4 ºC.

Vacuum packaging changes the gaseous environment at the sample surface: respiration of microorganisms at the sample surface or the sample itself produces CO_2 and eventually the oxygen concentration within the pack falls below 1% while the CO_2 concentration rises to 20% or more (Eustace, 1981). The compositional changes of gas could have involved the control of oxygen-dependent microorganisms or oxidative degradation of meat in the bag.

IV – Conclusions

Mestura cocida showed high counts of Enterobacteriaceae and psychrotrophs bacterias. Sulfite reducing clostridia only was found in the control sample. *Staphylococcus aureus* and *Salmonella* have not been found in any samples. The amounts of TBARS formed in the course of storage were higher the critical value of 3 mg/kg at which rancidity is detected.

To extend the shelf life of this product would be advisable: reduction of microbial contamination during production, growth prevention of spoilage bacteria and application of decontamination procedures to product after packaging.

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