

# THE SENSORY IMPACT OF SALT REPLACERS IN REDUCED SODIUM DRY CURED LACÓN

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**Abstract – Sodium chloride plays an important role in processed meat; reduction strategies remain relevant for the industry as they continue to meet the consumer demand for low sodium foods. Three salt replacers (KCl, CaCl<sub>2</sub> and MgCl<sub>2</sub>) were evaluated for their ability to effectively reduce sodium, while maintaining the sensory properties of dry-cured lacón. Eight sensory traits of dry-cured “lacón” were assessed: color intensity, odor intensity, hardness, juiciness, saltiness, metallic taste, bitterness and overall flavour. The intensity of every attribute was expressed on a structured scale from 0 (very low) to 9 (very high). The partial substitution of NaCl by other chloride salts can be achieved without significantly affecting sensory attributes of dry cured lacón.**

**Key Words – Meat products, organoleptic attributes, partial substitution**

## I. INTRODUCTION

Salt is an essential ingredient in dry-cured products due to its numerous technological benefits. Due this, sodium reduction in meat products is particularly difficult because it necessarily involves removing or partially NaCl levels [1]. Dry-cured lacón is a traditional cured meat product made in the north-west of Spain from the fore leg of the pig which is cut at the shoulder blade-humerus joint, following very similar manufacturing processes to those used in the production of dry-cured ham as described by Marra *et al.* [2]. Nowadays, there is a trend to reduce the salt content in meat products because an excessive sodium intake contribute to raised blood pressure in salt susceptible consumers [3]. The main purpose of this study was to evaluate the effect of the partial substitution by other chloride salts (KCl, CaCl<sub>2</sub> and MgCl<sub>2</sub>) on the organoleptic attributes of the dry-cured lacón.

## II. MATERIALS AND METHODS

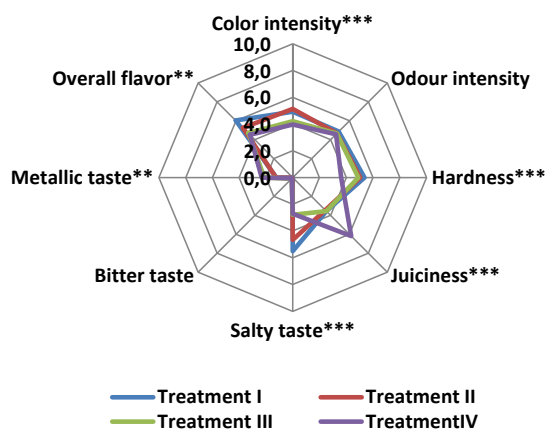
In order to carry out this study, four batches of lacón were manufactured. Each batch consisted of four lacón pieces that in the green stage weighed around 4 kg. Lacón from the first batch were salted with the traditional NaCl (100% NaCl, treatment I) and were used as control of the sensory evaluation. The other batches were salted in the same way but with partial substitutions of NaCl by other salts. So, the second batch was salted with 50% NaCl and 50% KCl (treatment II); the third batch with 50% NaCl, 25% KCl, 15% CaCl<sub>2</sub> and 10% MgCl<sub>2</sub> (treatment III); and the fourth batch with 45% NaCl, 30% KCl, 15% CaCl<sub>2</sub> and 10% MgCl<sub>2</sub> (treatment IV). The salting stage was carried out in saturated brine (30% for each treatment) for 4 days (1 day of brine per kg of raw material). After the salting stage the pieces were taken from the heap, brushed, washed, and transferred to a post-salting room where they stayed for 14 days at 2-5°C and around 85-90% relative humidity. After the post-salting stage the pieces were transferred to a room at 12°C and 74-78% relative humidity where a drying-ripening process took place for 84 days. Previous to the sensorial analysis, the samples were desalted in a container with water for 48 h. The water was removed every 16 h. After this period, the samples were cooked in boiling water for 2 h.

A trained panel was conducted with eight panellists selected from the Meat Technology Centre of Galicia. A three-digit code has been assigned to the samples, which were evaluated by each panellist following a randomized complete block design. Data were analyzed using XLSTAT version 2012.6.09 for Microsoft Windows (Addinsoft, New York, N.Y., U.S.A). A 2-way Mixed Model ANOVA was conducted, with panellist and treatment as independent variables. Dependent variables were intensity ratings corresponding to each sensory attribute. Tukey's HSD mean separation tests were used for post hoc analyses ( $\alpha=0.05$ ).

## III. RESULTS AND DISCUSSION

The results of the sensory analysis are shown in Figure 1. For color intensity, treatment II and control (treatment I) were rated significantly higher than treatments III and IV ( $P<0.0001$ ). This outcome could be due to use CaCl<sub>2</sub>; Boyle *et al.* [4] found that Ca supplementation lightened internal color of frankfurters which were less red compared to control. Treatments I, II and III showed higher scores in hardness than IV treatment ( $P<0.0001$ ).

These findings are in agreement with those reported by Horita *et al.* [5] who observed that substitution of 50% NaCl by KCl did not influence the hardness of the processed mortadella. Concerning salty taste, treatment I was significantly higher than all other samples ( $P<0.0001$ ) and no differences between III and IV treatments ( $P>0.05$ ) were observed. It is interesting to note that bitterness was not rated significantly different among treatments ( $P>0.05$ ). This outcome is in agreement with those reported by Armenteros *et al.* [6] who noticed that bitter taste did not differ when the NaCl concentration was reduced by 50% KCl in dry-cured loin. For metallic taste, treatments IV and III were significantly higher than treatments I and II ( $P<0.01$ ). This result could be due to use divalent cations, they are characterized by bitter tastes, producing metallic, astringent and irritative sensations [7].



**Figure 1.** Spider plot representing mean intensity ratings from trained sensory panel assessments for dry cured lacón. Significant level:  $p<0.01^*$ ,  $p<0.001^{**}$ ,  $p<0.0001^{***}$  (Tukey's HSD).

Regarding overall flavor, the treatment with the highest scores was the control ( $P<0.001$ ). This is in agreement with Rabe *et al.* [8] who showed that sodium chloride is a flavor enhancer because its addition prompts the formation of strong ion-dipole interactions between the salt ions and water decreasing availability of water molecules for the solubilisation of flavor compounds.

#### IV. CONCLUSION

The partial substitution of NaCl by other chloride salts (KCl, CaCl<sub>2</sub> and MgCl<sub>2</sub>) can be achieved without significantly affecting sensory attributes of dry cured lacón.

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