

Influence of drying temperature on colour and textural traits of dry-cured “lacón”

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Abstract—The aim of this study was to analyze the effect of drying temperature during ripening stage on physicochemical, weight loss, colour parameters and texture traits of dry cured “lacón”. Three different drying temperatures were used in this study: 12, 16 and 22 °C. A total period of 102 days was applied to elaborate the product and the salting process took 0.75 days/kg. As the processing period increased, moisture, luminosity, yellowness and cooking losses decreased in the three groups, whereas weight loss, salt content, redness and shear force increased. Moisture content, weight loss and shear force were the most affected in all physicochemical traits, being influenced by drying temperature at the end of process.

Keywords: dry-cured “lacón”, drying temperature, shear force, colour

I. INTRODUCTION

Dry-cured pork foreleg “lacón” is a typical product manufactured in the NW of Spain, where it has a great economical importance. In 2001, “lacón” was recognized in the EU with the Geographically Protected Identity (G.P.I.) (Official Journal of the European Communities, 2001) in order to differentiate this original product. The processing is very similar to that followed in the elaboration of dry-cured ham, with the following three stages: salting, post-salting and drying or curing. However the length of these stages is shorter in dry-cured “lacón” due to the smaller size of the pieces (around 4 kg) and the fact that the final product is desalting and cooking. Previous studies on dry-cured “lacón” have mainly concerned the biochemical and sensory characterisation of the final product (Marra, Salgado, Prieto, & Carballo, 1999) and investigation of the biochemical changes (Lorenzo, Prieto, Carballo, & Franco, 2003) and microbiological characteristics (Vilar, García Fontán, Prieto, Tornadizo, & Carballo, 2000) that take place during the manufacturing process. Nevertheless, dry-cured meat quality is not only defined in terms of biochemical (aroma and flavour) and microbiological characteristics of the product, because also colour and texture properties are decisive quality factors. Colour is an important quality property which contributes to its sensory acceptability (García-Esteban, Ansorena, Gimeno, & Astiasarán, 2005).

On the other hand, drying period is the larger stage in the steps in dry-cured product processing, where there are many biochemical reactions which produce flavour components and the highest change in dry cured meat are produced. Arnau, Guerrero, & Gou, (1997) found that the drying temperature in the last ageing month had an important effect on the ham texture properties. However, scarce information is known about the changes related to texture and colour change in dry-cured “lacón” during ripening and whole process, hence the aim of this study was to describe the evolution of colour and textural traits of dry-cured “lacón” during the elaboration process when we modified drying temperatures.

II. MATERIALS AND METHODS

II.1. Elaboration of dry-cured “lacón” and sample collection

In order to carry out this study three batches of “lacón” were manufactured. Each batch consisted of four “lacón” pieces that in the fresh stage weighted 4 kg each. All batch were salted during 3 days (0.75 days/kg) being the temperature of the salting room between 2 and 5 °C and the relative humidity (RH) between 80 and 90 %. After the salting stage, the pieces were taken from the pile, brushed, washed and transferred to a post-salting room where they stayed for 14 days at a 2-5 °C and 85-90% RH. After the post-salting stage, the pieces were divided in three rooms with different ripening temperature: 12, 16 and 22 °C and with 74-78% RH where a drying ripening process took place for 84 days.

For weight loss determination, in each batch, samples were taken from fresh pieces, after the end of salting, after 7 and 14 days of post-salting and after 7, 14, 28, 56 and 84 days of drying ripening. For the rest of determination, a minor number of sampling point was used; samples were taken from fresh pieces,

after 14 days of post salting and after 28 and 84 days of drying ripening. Each sample consisted of one whole “lacón” piece.

II.2. Analytical methods

Semimenbranosus muscle was used for colour determination and textural properties whereas the rest of the piece was skinned and deboned and finally minced in a high-capacity mincer to determine the rest of measurements. Weight loss was measured by gravimetric difference in each sampling point. Moisture and total chlorides were quantified according to the ISO recommended standards 1442:1997 (ISO, 1997) and Carpentier-Vohlard official method (ISO 1841-1:1996) respectively. A portable colorimeter (Konica Minolta CR-400) was used to measure meat colour in the CIELAB space (CIE 1978). (lightness, L*; redness, a*; yellowness, b* (CIE 1978). Samples were cooked placing vacuum package bags in a water bath with automatic temperature control until reached internal temperature of 70 °C, controlled by thermocouples After cooking, samples were cooled at room temperature, placing vacuum package bags in a circulatory water bath set at 18 °C during a period of 30 minutes and percentage cooking loss was recorded. All samples were cut perpendicular to the muscle fibre direction at a crosshead speed of 3.33 mm/s in a texture Analyzer TA.XT.plus of Stable Micro Systems. Maximum shear force necessary to cut the sample were obtained.

III. RESULTS AND DISCUSSION

Figure 1 shows the evolution of the moisture content and weight loss (a), NaCl and luminosity (b), redness and yellowness (c) maximum shear force and cooking loss (d) in the interior of the pieces during “lacón” batches manufacture with different drying temperatures.

Moisture content decreased progressively as processing time increased, reaching a final mean value of 49g/100g total solid. Moisture evolution was in agreement with Lorenzo, García Fontán, Franco, Carballo, (2008) who observed a quite similar alteration in “lacón” total solid content. They were slightly higher than those obtained by other authors in Spanish “cecina” (García, Díaz, & Zumalacarregui, 1997). On the contrary, total weight loss increased as processing period increased. Moisture and weight loss showed a major variation at the end of drying stage when temperature increased to 22 °C (Figure 1 (a)).

Chloride content in the interior of the “lacón” pieces is expressed as g/100 g of total solids and its values increased during the salting and post-salting stages, reaching mean values around 17 g/100 g of TS at the end of post-salting stage and decreasing to 15 g/100 g of TS at the end of the manufacture process. No differences were found for drying temperature effect at the final step. Our results were identical to those found by Marra et al., (1999) and they were two points higher than those noted by Lorenzo et al., (2008) who worked with dry-cured “lacón” in similar conditions, except for salting stage where 1 days/kg salt conditions were used. However, these values remain in the upper extreme range of those observed by other authors in different dry-cured meat products that are made from entire pieces (Monin et al., 1997). This can be explained by the greater surface and lesser thickness of the “lacón” pieces which favours the salt penetration during salting process.

A luminosity decrease in “lacón” pieces was observed during first two steps (salting and post-salting). “Lacón” luminosity remained constant, after these two periods, so drying temperatures did not affect this colour characteristic. The highest luminosity level was showed by the batch that was drying at 22 °C. Yellowness followed a similar evolution, whereas redness tended to increase during elaborating process. Data on the colour traits changes in cured meat product from whole piece are scarce. Cilla, Martínez, Beltrán, & Roncales, (2005) reported small non-significant changes in colour parameters, with the exception of redness index, which increased significantly throughout dry-cured ham ripening.

Figure 1 (d) shows the evolution in the shear force during elaborating process. There were evident textural changes in the samples. Shear force increased as processing time increased grown for the three drying temperatures groups. There were important differences among batches during drying stage (18 to 102 days). The batch that was dried at 22 °C reached a final value of 230 kg/cm². Texture properties are very important for this product, because it is usually cut in steaks of 3-4 cm and it is consumed after being cooked. In this aspect, we have not found any data in the literature about shear force or other textural traits. The high shear force value at the end of the process that is due to changes in hardness in ripening of dry-cured meat products have been attributed to both water content and state of proteins (Monin et al., 1997). An important modification of the water content could be noticed and the reason for this alteration is the volume/surface ratio that is particular in “lacón” pieces as we mentioned before. In addition, another important decrease in water content happens when “lacón” pieces are cooked; this is confirmed by the 5% cooking loss value at the end of process. Cooking loss decreased during storage in all cases.

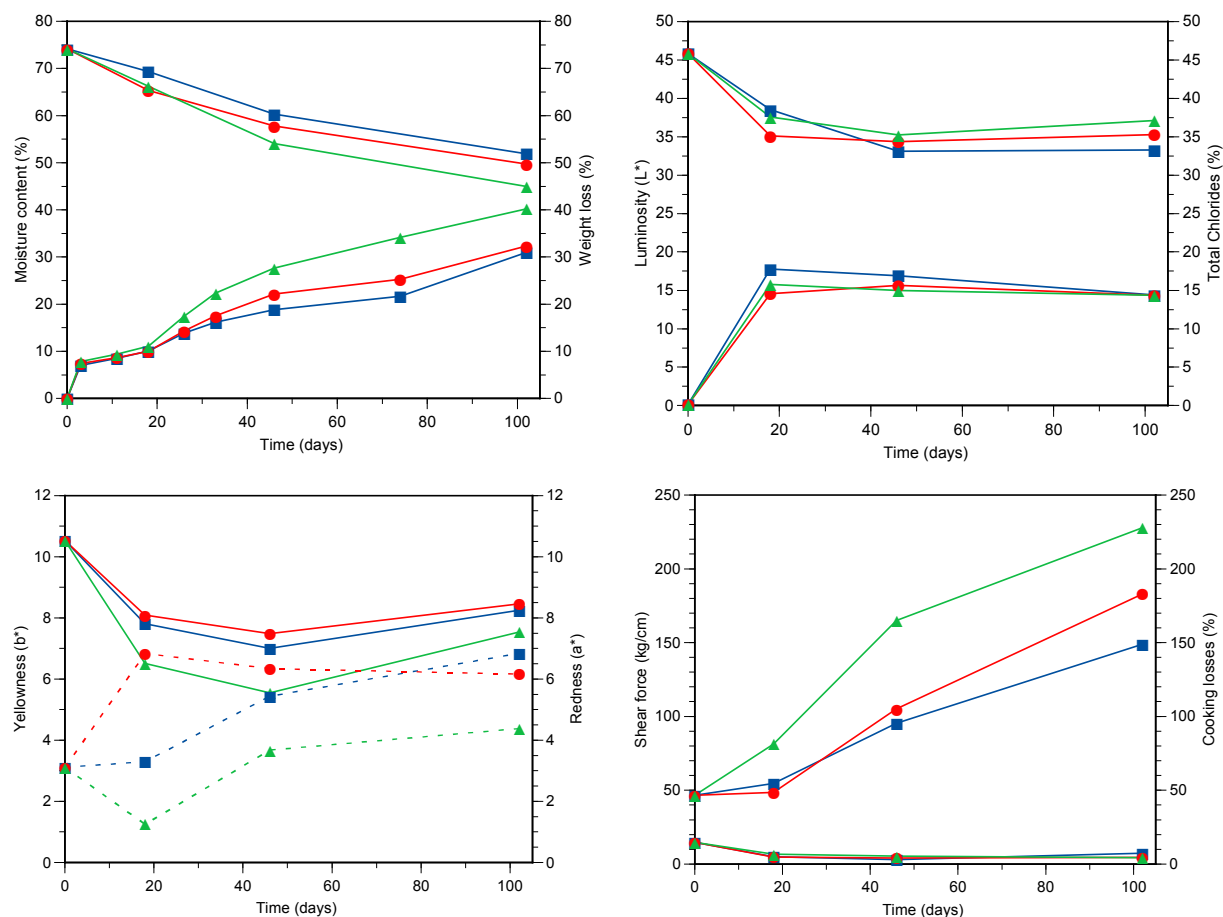


Figure 1. Changes in moisture content and weight loss (a), NaCl and luminosity (b), redness and yellowness (c) maximum shear force and cooking loss (d) during the manufacture of dry-cured “lacón”. Effect of drying temperature (■ =12 °C, ● =16 °C ▲ =22°C).

IV. CONCLUSIONS

The results of this study indicated that drying temperature of dry-cured “lacón” during curing stage affected physicochemical traits, especially moisture, weight loss and shear force. This information could be very useful to the industry allowing modifying the drying process in order to improve quality in the final product.

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