Physico-chemical and sensory characteristics of dry cured loin preserved under different vacuum-packed models

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Abstract

Physico-chemical and sensory characteristics of three different types of vacuum-package Iberian dry-cured loin (DCL) were studied: (i) conventional presentation (outstretched slices), (ii) innovative presentation (slices were piled up horizontally) and (iii) intact DCL which was freshly sliced before consumption. After being packed, loins were refrigerated under fluorescent light for one month in order to reproduce the conditions in which these products are preserved and displayed until consumer's purchase. At the end of the storage, DCL were analysed for intramuscular fat (IMF), moisture and proteins while instrumental colour was measured on the slice surfaces. A quantitative descriptive analysis (QDA) (19 attributes) and a hedonic test (ranking of preference test) were carried out by a trained panel (n=12). Not significant differences for IMF, protein and moisture content were obtained between the three types of loins. DLC from the innovative presentation showed lower values for L* ($p<0.05$) compare to the other two batches and intact DCL showed higher values of a*. Regarding QDA, attributes related to appearance (fat and lean) and texture showed the most relevant and significant results. Preference test revealed that panellist did not show a clear preference for any of the DCL evaluated.

Introduction

Dry cured loin (DCL) derived from Iberian pigs is one of the most appreciated processed meat products by Spanish's consumers (Ruiz et al., 2002) due to its outstanding sensory quality which is mainly based on the high intramuscular fat (IMF) content of the Iberian pig breed (Ventanas et al., 2005).

After processing, dry-cured products are displayed in the store and that storage has a great influence on the physico-chemical changes (oxidation, drying, modification of color and texture) occurred until purchase as well as on consumer choice. The most widespread method to increase the shelf-life of sliced dry-cured products avoiding or delaying the reported changes is the vacuum-package system which is generally perceived as easy to handle and store by consumers (Resurreción, 2003).

The way of displaying DCL from Iberian pigs in the Spanish's stores is very limited and mainly two different presentations are shown in the counters: pre-sliced and vacuum-packaging DCL and "vela" presentation: the whole piece of dry-cured loin (50-70 cm of height). There is an increasing interest in new and convenient formats in order to diversify the way Iberian dry-cured products are presented to consumers.

In the present study, an innovative presentation of sliced and vacuum-packaged Iberian DCL was proposed as an alternative to the conventional vacuum-packaged presentation (outstretched slices). In this new format, the DCL slices were piled up horizontally which would involve several advantages compare to the conventional way: (i) the surface of the slices would not be directly exposed to pro-oxidant fluorescent light, (ii) the phenomenon linked to adherence between slices and loss of fat would decrease and (iii) the accessibility to the slices is easier without modifying the external appearance which is quite close to the intact presentation ("vela").

The objective of this study was to evaluate the suitability of the new format in terms of physico-chemical characteristics and sensory evaluation.

Material and methods

Samples and packing

This study was carried out with 30 Iberian DCL which were processed following the method described by Ventanas et al. (2006) with some modifications. Loins were stuffed in collagen casings and once the processing was completed (100 days) the three different vacuum-packaging presentations were prepared in MOBEPACK Company (Salamanca; Spain). Ten DCL were used for each type of vacuum-packaged batch. Conventional presentation batch was made with 1.2 mm DCL slices placed stretched out in the package. Innovate presentation was designed with 1.2 mm DCL slices horizontally piled up. The third batch was the whole DCL (intact presentation). For each type of presentation several vacuum-packages (250 g of product

per package in intact presentation and 150 g in sliced ones) were prepared. After that, packages were stored under fluorescent light for one month at refrigerated conditions until physico-chemical and sensory evaluation.

Physico-chemical analysis

After one month of storage, IMF (Folch et al., 1951), moisture (AOAC, 1990) and proteins (Kjeldahl method, AOAC, 1990) were quantified and instrumental colour (CIE, 1976) was measured using a Minolta Chromameter CR-300 on the slice surfaces.

Sensory analysis

Quantitative descriptive analysis (QDA) method (Ruiz et al., 1998) was used to evaluate the three dry-cured loins batches by a trained panel (n=12) for 19 attributes related to aspect, odour, texture and flavor. The intact DCL batches were sliced during the session using a commercial slicing machine. All sessions were done in a six standard booth sensory panel room. Panellist used a 10 cm unstructured line (‘‘less’’ to ‘‘more’’) for quantifying each attribute. FIZZ Network (v. 1.01: Biosystemes, France) program was used for getting the data. After each QDA session, the same vacuum-packaged DCL batches were subjected to another sensory evaluation by the same panel, using a ranking test in order to evaluate the preference for overall linking.

Statistic analysis

Experimental data (physico-chemical and QDA analysis) were compared by a one-way ANOVA using the GLM procedure and Tukey’s test. Data from each ranking test of preference were analysed using the Friedman non-parametric statistic test and the Wilcoxon Mann-Whitney. A level of significance of $p<0.05$ was set. SPSS statistical software (v.12.0) was used for all statistical tests.

Results and discussion

Table 1 shows the results from the chemical analysis and instrumental color measurements of Iberian DCL from the three different batches. As expected, there were not significant ($p>0.05$) differences in chemical composition between the studied batches since all DCL derived from Iberian pigs reared and fed under the same conditions. The post-processed treatment did not modify these chemical parameters. Regarding instrumental color, conventional and innovate batches showed significantly higher values of a* (redness) compared to intact DCL batch while values of L* (lightness) coordinate had the opposite behaviour.

Table 1. Proximal chemical composition and instrumental color measurements (means ± standard deviation) of innovate, intact and conventional presentations of Iberian DCL

	Innovative	**Intact**	**Conventional**	*p*[1]
IMF (%)	19,54 ± 3,19	20,71 ± 3,76	19,41 ± 3,6	n.s
Protein (%)	41,66 ± 1,31	39,67 ± 3,38	41,82 ± 3,1	n.s
Moisture (%)	32,14 ± 2,81	34,14 ± 3,03	33,47 ± 1,94	n.s
L*	$43,27^{b}$ ± 3,25	$47,36^{a}$ ± 4,73	$43,64^{ab}$ ± 2,74	*
a*	$31,33^{a}$ ± 2,05	$26,9^{b}$ ± 4,28	$30,65^{a}$ ± 2,79	*
b*	17,74 ± 2,73	17,37 ± 3,87	17,67 ± 1,49	n.s

[1]*p*: n.s ($p>0.05$), * ($p<0.05$). Different letters in the same row mean statistic differences between means.

Means scores of appearance and texture traits are shown in Figure 1. According to instrumental color measurements, loins from the innovate and conventional batches were considered significantly ($p<0.001$) redder than the intact loin. Panellist scored loins from the innovate DCL presentation significantly ($p<0.001$) less bright and with less marbling intensity compare to the other two studied batches. Meat choice of consumers is mainly based on appearance attributes particularly fat content and color. Regarding color, higher a* values and redness are preferred by consumers (Resurreción, 2003) and therefore, conventional and innovate batches can be considered with a higher commercial value compare to intact DCL batch.

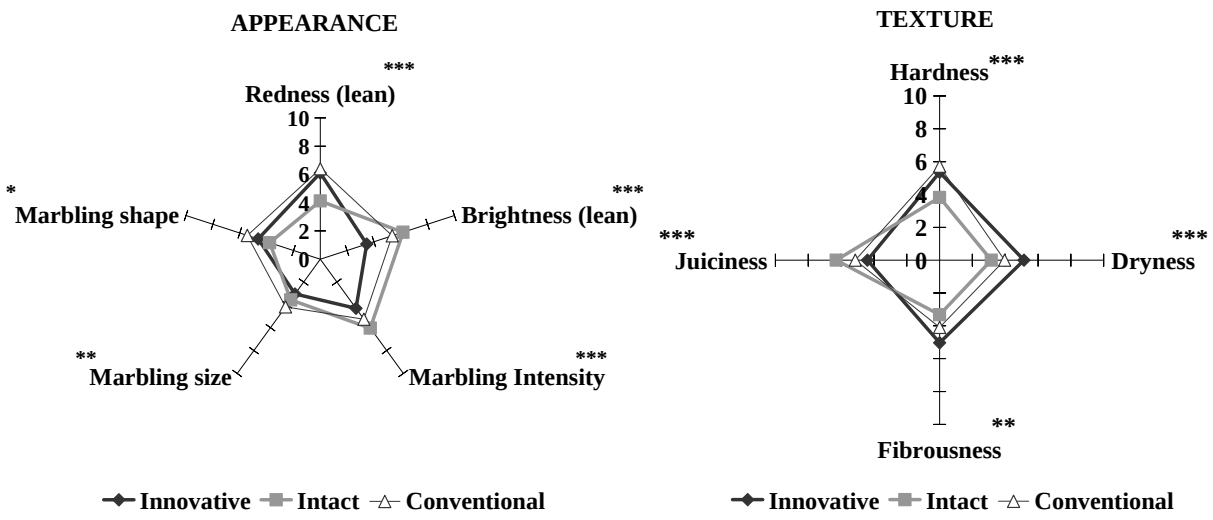

Figure 1. Appearance and Texture sensory profile of innovate, intact and conventional presentations of Iberian DCL. * ($p<0.05$); ** ($p<0.01$); *** ($p<0.001$).

Intact DCL presentation was ranked with the best scores regarding texture traits since it was considered the least dry, fibrous and hard but the juiciest compared to the innovative and conventional DCL format. However, comparing both pre-sliced and vacuum-packaging DCL batches (innovative and conventional), for most attributes there were not significant ($p>0.05$) differences except for dryness.
Finally, there were not significant ($p= 0.273$, $\chi 2 = 2.60$) differences between the three DCL batches in the scores obtained from the ranking test of preference. According to these results, the innovative presentation had the same level of acceptance by the panellist than conventional format and also than intact one.

Table 2. Preference scores given by the panellist for the three different presentations of DCL (means ± standard deviation)

	Innovative	**Intact**	**Conventional**	p^1
Preference	1,91 ± 0,42	2,19 ± 0,58	1,91 ± 0,53	n.s.

n.s.: $p>0.05$. Rating scores for preference: 1: most preferred, 2: most preferred in second place, 3: least preferred.

Conclusions

This preliminary study supports that the proposed way of DCL vacuum-packaged presentation (pre-sliced and piled up horizontally) preserve the high sensory quality and level of acceptance compared to conventional pre-sliced DCL format and intact DCL.

Acknowledges

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