

EFFECT OF THE ADDITION OF *BIFURCARIA BIFURCATA* SEAWEED EXTRACT ON PHYSICO-CHEMICAL PARAMETERS IN HEALTHIER PORK LIVER PÂTÉ

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Abstract – The effect of the addition of natural *Bifurcaria bifurcata* seaweed extract on chemical composition and physical parameters of pork liver pâtés with 50% of fat replaced by canola and high oleic sunflower oil (75:25) was studied. The pâté samples were analysed after 0, 90 and 180 days of refrigerated storage (4° C). Moisture, fat and pH values were not affected by the inclusion of seaweed extract in pâté samples over time. On the other hand, yellowness (b*) presented the highest values in pâté samples manufactured with seaweed extracts, whereas luminosity and redness values were not influence by antioxidant extract neither storage time.

Key Words – Colour, pH, shelf-life, natural antioxidant

I. INTRODUCTION

Liver pâté is a traditional cooked meat product consumed in many countries, particularly in Europe [1] containing large amounts of fat, which make it a product with a high oxidative instability. Apart from this, oxidation produces several changes in meat pigments, thereby reducing the quality in terms of color [2]. To palliate the oxidation problem in the food industry, synthetic antioxidants such as tert-butyl-4-hydroxytoluene (BHT) are largely used, but they have been linked to health risks (carcinogenic potential) and, for that reason, current research focuses on replacing them with naturally occurring antioxidant [1]. In this sense, marine macro algae are reported to be a good source of natural antioxidants such as catechins, flavonols or polyphenols, with efficiency proved [3], presenting itself as an alternative to the use of synthetic antioxidants in fat products as pork liver pâté. Thus, the aim of this study was to assess the effectiveness of extract from *Bifurcaria bifurcata* as natural antioxidant on physico-chemical parameter of pork liver pâtés.

II. MATERIALS AND METHODS

II.1 Manufacture of the pâté

Three batches (BB batch corresponds to *Bifurcaria bifurcata* extract, added at 500 ppm, BHT batch is the positive control with 50 ppm of BHT and CO group corresponds to the control batch without antioxidant) in three different days were manufactured. The 50% of pork fat used in the manufacture of pâtés was replaced by canola and high oleic sunflower oils (75:25). The other ingredients (g/100 g) were: pork liver (33%), pork lean meat (20%), pork back fat (15%), water (11.43%), canola oil (11.25%), high oleic sunflower oil (3.75%), NaCl (2%), milk powder (2%), sodium caseinate (1%), potassium phosphate (0.5%), sodium nitrite (0.05%) and sodium ascorbate (0.025%). The pâtés samples were manufactured according to Pateiro *et al.* [1]

II.2 Physico-chemical and protein oxidation composition

The chemical composition was determined according to Pateiro *et al.* [1]. The pH was determined by a digital pH meter equipped with a penetration probe. Colour measurements [CIELAB space: lightness, (L*); redness, (a*); yellowness, (b*)] were carried out by using a CM-600d colorimeter. Three measurements were performed for each sample.

II.3 Statistical analysis

Results of analyses was examined using a model ANOVA, where the physico-chemical parameters were set as dependent variables, the different antioxidant added and time as fixed effects. The pairwise differences between least-square means were evaluated by Duncan's method. Differences were considered significant if $P < 0.05$. The values were given in terms of mean values and standard error (SEM). All analyses were conducted using the SPSS Statistics 19.0 software package.

III. RESULTS AND DISCUSSION

No significant differences ($P > 0.05$) were found among batches in moisture and fat content (data not shown). This result is in agreement with those reported by Estévez *et al.* [4]. Nevertheless, significant differences ($P < 0.05$) were detected for protein in BB batch, achieving higher values than CO and BHT batches. This fact could be due to the protein content of seaweed extract used. Agregán *et al.* [5] noted the presence of protein in BB extract, 53.33 g/100 g of extract. Table 1 shows the effect of the different antioxidant added in pork liver pâtés on pH and colour parameters. All batches presented the same pH evolution pattern along the storage time. Contrary, Pateiro *et al.* [6]

found significant differences ($P < 0.05$) in control and BHT batches along the storage when they used 50 ppm of tea and grape seed extract as antioxidants in liver pâtés.

Table 1. Effect of different antioxidant extract on physico-chemical parameter of liver pâtés

| Parameters | Days | Batch | | | SEM | Sig |
|------------------|------|--------------------|---------------------|--------------------|------|-----|
| | | CO | BHT | BB | | |
| pH | 0 | 6.04 | 6.09 | 6.07 | 0.01 | ns |
| | 90 | 6.07 | 6.11 | 6.1 | 0.01 | ns |
| | 180 | 6.1 | 6.13 | 6.1 | 0.01 | ns |
| | SEM | 0.01 | 0.01 | 0.01 | | |
| | Sig. | ns | ns | ns | | |
| Color parameters | | | | | | |
| L* | 0 | 55.39 | 54.64 | 53.79 | 0.36 | ns |
| | 90 | 54.39 | 53.94 | 53.79 | 0.49 | ns |
| | 180 | 54.57 | 55.02 | 53.5 | 0.49 | ns |
| | SEM | 0.45 | 0.39 | 0.49 | | |
| | Sig. | ns | ns | ns | | |
| a* | 0 | 14.95 | 15.06 | 15.21 | 0.13 | ns |
| | 90 | 15.02 | 15.07 | 15.58 | 0.21 | ns |
| | 180 | 14.87 | 15.04 | 15.51 | 0.16 | ns |
| | SEM | 0.14 | 0.15 | 0.2 | | |
| | Sig. | ns | ns | ns | | |
| b* | 0 | 17.36 ^a | 17.63 ^{ab} | 18.11 ^b | 0.12 | * |
| | 90 | 17.69 | 17.6 | 18.11 | 0.19 | ns |
| | 180 | 17.24 ^a | 17.69 ^{ab} | 17.97 ^b | 0.12 | * |
| | SEM | 0.14 | 0.16 | 0.1 | | |
| | Sig. | ns | ns | ns | | |

Batches: CO: control; BHT and BB: *Bifurcaria bifurcata* extract; ^{a-b} Mean values in the same row with different letter presented significant differences ($P < 0.05$); Sig: significance: ** ($P < 0.01$), * ($P < 0.05$), n.s. (not significant)

Regarding colour parameters (L*, a*, b*), they did not show significant differences ($P > 0.05$) neither among batches nor along storage time, except for b* at the beginning and at the end of storage, where BB batch showed high b* values than CO batch, even at 90 days, although at this time was not significant. Estévez *et al.* [4] also reported no significant differences ($P > 0.05$) among batches for L*, except at the end of refrigerated storage, in porcine liver pâtés with sage and rosemary essential oils. However, Pateiro *et al.* [1] found significant differences ($P < 0.01$) among batches for L* values in liver pâtés with natural extracts from chestnut, tea and grape seed extract.

IV. CONCLUSION

The antioxidant activity of *Bifurcaria bifurcata* seaweed extract in pork liver pâtés based on measured parameters was not clear. Further studies (sensorial and lipid and protein oxidation) are necessary in order to assess the possible effectiveness of the extract.

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