OLIVE OIL HYDROGELS WITH POLYSACHARIDES TO FORMULATE HEALTHY AND SUSTAINABLE FRANKFURTERS

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I. INTRODUCTION

One of the considerations in the development of healthier and more sustainable meat products, demanded by today's society, concerns to reformulation processes based on the replacement of meat raw materials (such as animal fat) by other non-meat ingredients more in line with the health recommendations and environmental aspects [1]. In this regard, different strategies have recently been proposed for the incorporation of vegetable oil hydrogels structured with polysaccharides which could act as an animal fat replacer [1]. These processes could simultaneously offer new possibilities to improve the fat content of meat products and adjust them to sustainability criteria.

The aim of this work was to evaluate global characteristics, in terms of nutritional, technological, sensorial and structural properties, of healthier and sustainable frankfurters formulated using olive oil hydrogel based on polysaccharide as animal fat replacers.

II. MATERIALS AND METHODS

Four frankfurters were prepared (Table 1): two control samples with animal fat (pork backfat) (AF), normal-fat (N-AF) and low-fat (L-AF) and two reformulated in which the AF was completely replaced by olive oil hydrogels with polysaccharides (OHP) to elaborate normal (N-OHP) and low fat (L-OHP) frankfurters [2]. Additives added: 2.0 g/100 g NaCl; 0.30 g/100 g sodium tripolyphosphate; 0.012 g/100 g sodium nitrite; 0.5 g/100g flavouring. OHP were elaborated mixing in a homogenizer sodium alginate (1%), CaSO4 (1%), sodium pyrophosphate (0.75%) and dextrin (2.25%) with water (40 %) and olive oil (55%) [3]. Proximate analysis (moisture, ash, protein and fat), Processing loss, Texture Profile Analysis (TPA), sensory analysis and FT-Raman spectroscopic analysis were performed [2, 4].

Table 1. Formulation [% meat, animal fat (AF), olive oil hydrogel with polysaccharides (OHP), and water], processing loss (PL), TPA parameters (hardness and chewiness) and relative intensity of $I\nu_{as}CH_2/I\nu_sCH_3$ from Raman spectra of frankfurters.

Samples*	Meat (%)	AF (%)	OHP (%)	Water (%)	PL (%)	Hardness (N)	Chewiness (Nxmm)	$I\nu_{as}CH_2/I\nu_sCH_3$
N-AF	63	21	-	13.19	14.7 ± 0.7^c	27.6 ± 0.4^b	121.9 ± 1.3^b	0.94 ± 0.01^b
L-AF	63	9	-	25.19	22.7 ± 1.3^a	22.4 ± 0.5^d	98.9 ± 3.5^d	0.99 ± 0.05^a
N-OHP	63	-	32.5	1.69	13.8 ± 0.6^d	28.5 ± 0.3^a	132.5 ± 1.2^a	0.91 ± 0.02^c
L-OHP	63	-	14	20.19	18.9 ± 0.9^b	24.7 ± 0.5^c	117.3 ± 0.8^c	0.90 ± 0.03^c

*formulated with normal (N-AF) and low (L-AF) AF content and with OHP used as total animal fat replacers in normal (N-OHP) and low (L-OHP) fat content samples. Means ± standard deviation. Different letters in the same column indicate significant differences ($P<0.05$).

III. RESULTS AND DISCUSSION

Protein content (16%) was similar ($P > 0.05$) in all frankfurters. The lowest ($P < 0.05$) fat content and moisture values were recorded in L-AF and L-OHP (Table 2). N-AF and L-AF contained the lowest ($P < 0.05$) proportion of ash (Table 2). Frankfurters reformulated with OHP showed lower ($P < 0.05$) processing loss and higher ($P < 0.05$) hardness and chewiness that their counterpart with AF (Table 1). In general, although differences were detected in the sensory attributes of frankfurters reformulated with OHP, these products were judged acceptable by panellists (Fig. 1). Raman spectra in the 2800−3025 cm^{-1} region (Fig. 2) showed that the lowest ($P < 0.05$) values of $I\nu_sCH_2/I\nu_{as}CH_2$ (I_{2850}/I_{2880}) corresponded to frankfurters reformulated with OHP (Table 1). This fact suggests more lipid acyl chain disorder which would imply more lipid-protein interactions in frankfurter elaborated with OHP as animal fat replacer. These specific structural features were significantly correlated to processing loss, hardness and

chewiness. Similar behaviour has been found in frankfurters reformulated with other animal fat replacers elaborated with gelling procedures [1,2].

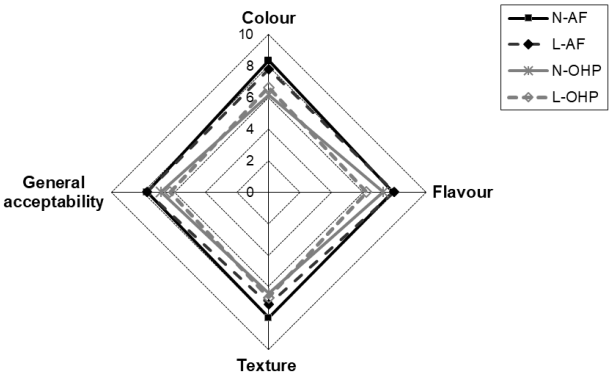

Fig.1. Sensory evaluation of frankfurters.

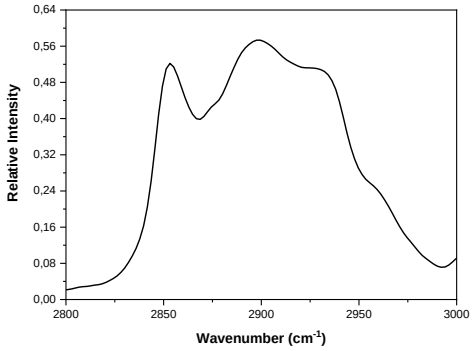

Fig. 2. Typical Raman spectra in the 2800−3025 cm^{-1} of frankfurter formulated

IV. CONCLUSION

This study presented further advances in the development of frankfurters healthier and more sustainable using a novel ingredient such as OHP as animal fat replacers. This strategy improves fat content of frankfurters and reduces the use of meat raw material without adversely affecting the sensorial and technological properties of the final product. In addition, the relationship found between structural and technological properties of frankfurters could be help for understand protein and lipid interactions in specific technological properties such as texture or processing loss, which are very important for the acceptance of consumer.

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