

Chestnut (*CaStanea sativa* Mill) emulsion gel as partially fat replacers in frankfurt-type sausage formulation (#245)

Juana Fernandez-Lopez, Carmen M. Botella-Martínez, Raquel Lucas-Gonzalez, Estrella Sayas-Barbera, Jose A. Perez-Alvarez, Manuel Viuda-Martos

Miguel Hernandez University, IPOA Research Group. Agro-Food Technology Department. Polytechnical Orihuela High School, Orihuela, Spain

Introduction

Frankfurt-type sausage is one of the most popular processed meat products in the world. However, it should be borne in mind that the high fat content (15-30%) and the quality of these fats (mostly saturated fatty acids) used to obtain the Frankfurt-type sausage and other process meat products have been associated with the development of several diseases such as: obesity, coronary heart disease and so on. The meat industry has diverse possible strategies for developing healthier meat and meat products. Essentially, three kinds of strategies are used to achieve this goal, these are associated with animal production, the handling of meat raw materials, and the reformulation of meat derivatives. The substitution of fat has been studied for many years and has its own terminology. The term "fat replacers" to denote the ingredients or additives used to diminish the fat content in foods. These are ingredients which structurally may be considered fats, proteins, or carbohydrates, that is, any raw material used to replace fat in the formulation. This study aimed to partially replace the pork backfat used in the formulation of Frankfurt-type sausages by emulsion gels formed by avocado oil and chestnut flour and determine the effect of this substitution on the chemical and technological properties of these products.

Methods

Oil-in-water (O/W) emulsion gel was used as fat replacers in Frankfurt-type sausage. Chestnut emulsion gel (CEG) was prepared with: chestnut (*Castanea sativa* Mill) flour 20%, avocado oil (30%), water (48%) and Xanthan gum (2%). Frankfurt-type sausages were made following traditional formula [1] with 65% pork meat and 35% pork backfat. Three different formulations were prepared: the original mixture was used as control sample (CS). The other samples were formulated partially replacing pork backfat with 15% of CEG (CEG15) and 20% of CEG (CEG20). Proximate composition was determined according to Official Methods [2]. Residual nitrite level (mg NaNO₂/kg sample) was determined according to standards ISO/DIS 2918.26. Lipid oxidation was assessed by the 2-thiobarbituric acid (TBA) method of Rosmini et al. [3]. The emulsion stability was evaluated as the percentage of total expressible fluid (TEF) [4]. Data analysis were performed using a one-way ANOVA test and differences were considered significant at $p < 0.05$.

Results

Proximate analysis of samples showed several differences between samples. The CGE used as partially fat replacer decreased the moisture, fat and protein content ($P < 0.05$) with respect to CS and it did in a concentration-de-

pendent manner except for fat content. The samples where CGE was used as partially fat replacer showed lower residual nitrite level than the CS (Table 1). TBARS values (Table 1) were higher, in samples with CGE used as partially fat replacer than in control samples. This may be due to the fact that the fatty acids present in avocado oil are mostly unsaturated and therefore more easily oxidizable. As regards to the total expressible fluid (TEF), higher TEF values means that emulsion stability is lower. TEF values were higher in samples with CGE used as partially fat replacer than in control samples.

Table 1. Proximate composition and lipid oxidation of Frankfurt-type sausage partially fat replacer with chestnut emulsion gel.

	Moisture	Protein	Fat	Ash	Residual Nitrite	TBARS
CS	69.53±0.19a	17.07±0.76a	6.07±0.11a	3.96±0.02a	60.31±0.28a	0.42±0.04a
CEG 15	68.23±0.24b	15.08±0.35b	4.13±0.02c	4.10±0.34a	51.15±1.19b	0.68±0.05b
CEG 20	67.88±0.35b	14.60±0.19b	5.41±0.20b	4.84±0.71a	48.99±1.47b	0.83±0.08c

Results are expressed as g / 100 g of sample. Residual nitrite expressed as mg NaNO₂/ kg de sample. TBARS values expressed mgMA/kg sample. Values with a different letter in the same column are significantly different ($p < 0.05$)

Conclusion

The use of plant-based flours, such as chestnut flour is a good alternative in the development of reduced fat meat products. In particular, the substitution of pork fat with an emulsion elaborated with avocado oil and chestnut flour increased the healthiness of the product, reduced fat content and improved the unsaturated fatty acid content. Additionally, the use of chestnut emulsion gel as novel ingredient appears to be a viable alternative in the meat processing industry due to increased stability of the product because reduced the nitrite residual content.

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LITERATURE

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Notes

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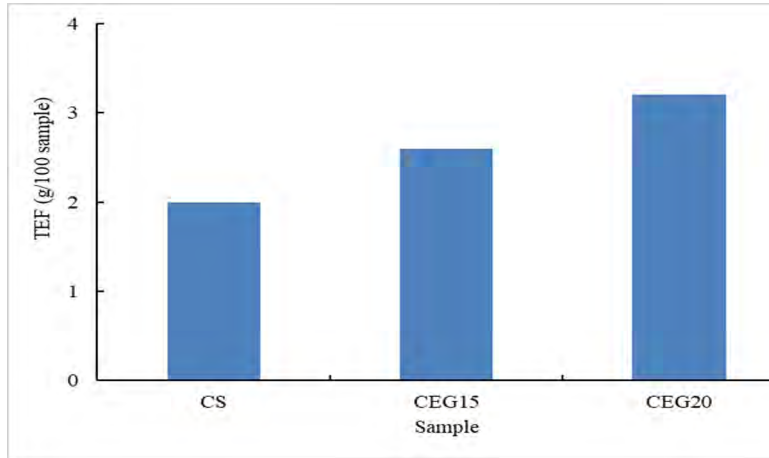


Figure 1. Emulsion stability of Frankfurt-type sausage partially fat replacer with chestnut emulsion

Notes