



Quality parameters of frankfurter-type sausages with partial replacement of fat by hydrolyzed collagen



Samara C. Sousa ^a, Sinara P. Fragoso ^b, Cristiane R.A. Penna ^b, Narciza M.O. Arcanjo ^b, Fábio A.P. Silva ^b, Valquíria C.S. Ferreira ^b, Maria D.S. Barreto ^a, Íris B.S. Araújo ^{b,*}

^a Department of Agroindustry, Federal Institute of Education, Science and Technology of Paraíba - Sousa, 58800-970, PB, Brazil

^b Department of Food Engineering, Federal University of Paraíba, Joao Pessoa, CEP 58051-900, PB, Brazil

ARTICLE INFO

Article history:

Received 22 January 2016

Received in revised form

11 June 2016

Accepted 13 June 2016

Available online 15 June 2016

Keywords:

Frankfurter

Low-fat

Collagen

Sausages

Pork backfat

ABSTRACT

Frankfurters were manufactured to determine the effects of pork backfat replacement by hydrolyzed collagen on the quality parameters. Four formulations were developed: control (SS) and three levels of collagen replacements: 25% (CS25), 50% (SC50) and 75% (SC75). Appearance, aroma, texture, taste and overall acceptance were analyzed. Parameters like moisture, ash, lipid and protein, water activity (*A_w*), pH, water holding capacity (WHC), emulsion stability (ES), color (*L^{*}*, *a^{*}*, *b^{*}*) and shear force (SF) was analyzed, as well as the texture properties. SC25, SC50 and SC75 had better texture and taste compared to SS, but the appearance, aroma and overall acceptability did not differ among treatments ($p < 0.05$). In SC75, a 43% increase in protein content compared to SS was observed, and increased ash content. There were no changes in pH and *A_w* in sausages. *L^{*}* value decreased with fat replacement, and *a^{*}* did not change, but SC75 showed higher *b^{*}* value. From 50% of collagen addition, higher WHC and SF were obtained. In parallel, only hardness, and chewiness had effects significant, increasing in higher amounts of collagen, probably by aggregating water in the protein matrix. It was possible to obtain 50% reduction with hydrolyzed collagen without reducing the quality of sausages.

© 2016 Elsevier Ltd. All rights reserved.

1. Introduction

Consumers are increasingly concerned about the relationship between diet and health in terms of the quality of foodstuffs offered by the food industry, particularly meat and meat products, which present high nutritional value due to their protein content. However, it is known that the high fat and salt contents used to process meat products have been associated with the development of obesity, coronary heart disease (CHD) and arterial hypertension, respectively (Brewer, 2012). Therefore, the United States Department of Agriculture (USDA, 2002) has recommended dietary fat reduction and the creation of programs to obtain low-fat processed products. Hence, meat industries have been aimed to minimize the amount of fat in their products despite the fact that fat has a significant importance in meat product formulations, contributing to sensory aspects such as creaminess, appearance and flavor (Brewer, 2012).

Fat contributes to a number of quality attributes in processed

meat and excessive fat reductions may lead to problems in texture, flavor and technological properties. Nevertheless, the production of low-fat meat products is already a reality in several countries and can be accomplished in two ways: (i) by reducing fat content in formulations and (ii) by using fat replacers or substitutes. Most substitutes are used for partial fat replacement and may be grouped into those based on non-meat proteins, carbohydrates and synthetic compounds (Colmenero, 1996).

Collagen and its fractions play a significant role in human diets by having considerable contents of essential amino acids and contribute for the prevention of joint diseases (Ferraro, Anton, & Santé-Lhoutellier, 2016). Furthermore, these products have significant amounts of nutritive fibers and constitute a source of animal protein. The addition of collagen and its fractions in meat products may provide biological value and improve sensory properties of products consumed (Neklyudov, 2003; Prabhu, Doerscher, & Hull, 2004). In fact, collagen has been applied to meat products to enhance gelling and water-holding capacities and increase protein content (Prestes, Carneiro, & Demiate, 2012).

Emulsified meat products such as Frankfurt-type sausages are very popular worldwide due to their quick and easy preparation. Considering the high fat content found in these meat products

* Corresponding author.

E-mail address: iris_braz@hotmail.com (B.S. Araújo).

(20–30%), this study aimed to partially replace the pork backfat used in the formulation of Frankfurt-type sausages by hydrolyzed collagen and verify the effect of this substitution on the physical, chemical, sensory and instrumental texture of these products.

2. Material and methods

2.1. Preparation of frankfurters

The beef, pork meat, pork backfat and collagen casings were donated by Federal Institute of Paraíba. Hydrolyzed collagen powder (Germina[®], Parnamirim/RN, Brazil) and other supplies were purchased in local market. For the formulation of Frankfurters were prepared four treatments: control (SS) and three treatments with different levels of pork backfat replacement by hydrolyzed collagen: 25% (SC25), 50% (SC50) and 75% (SC75). Table 1 shows the ingredients and the formulations.

Meat used (beef and pork) were obtained from animals slaughtered in the Federal Institute of Paraíba, both under humanitarian conditions. According to each formulation, meat and backfat were cut and milled in industrial grinder. Another ingredients were separated, weighted and mixed with meat and backfat manually, maintaining at refrigeration temperature (4 °C) with use of ice, according to Table 1, until the formation of a mass. The mixture was carried to cutter until a homogeneous mass was formed and the meat emulsion was stuffed into artificial collagen sausage casings (approximately 26 mm of diameter) previously hydrated with cold water. The sausages were cooked in hot water at 80° C for 30 min. After cooking they have been emerged in cold water and the sausage casings was removed. The sausages were packed in polyethylene bags and stored at –18° C.

2.2. Microbiological analysis

The sausages were submitted to microbiological analysis of Coliforms at 45 °C, *Staphylococcus* positive coagulase, Clostridia sulfite reducers at 46 °C and *Salmonella* sp. These analysis are in accordance with the recommendations of the RDC n. 12, which provides for the Microbiological Standards for Foods (Brasil, 2001).

2.3. Sensory attributes

Frankfurters were subjected to sensory test of acceptance/preference with 64 untrained panelists, composed from students,

professors and other employees in Federal Institute of Paraíba, consumers of sausages and other meat products. The sausages were served in pieces of 15 g, with water and cracker among treatments. Acceptance testing for appearance, aroma, texture, taste and overall acceptance was performed with a 9-point hedonic scale (1- I unliked extremely; 9- I liked extremely). Panelists evaluated the following attributes: appearance, aroma, texture, flavor and overall acceptance (Meilgaard, 1999; Stone & Sidel, 2004).

Because it is a research involving humans, tests were performed according to the precepts of the Ethics Committee in Research with human beings, meeting the ethical and scientific requirements of the National Health Council (Brasil, 2012).

2.4. Compositional experiments

Frankfurter were subjected to analysis of moisture, ash and protein, according to the methodology proposed by AOAC. (2007). The lipid content was determined by the methodology of cold extraction (Folch, Lees, & Sloane Stanley, 1957). In addition to the Frankfurter it was determined the proximate composition of the hydrolyzed collagen powder used. All analyzes described were performed in triplicate.

2.5. Physical attributes

2.5.1. pH and water activity

The pH of Frankfurters was determined at pHmeter Q400AS (Quimis, São Paulo, Brazil), according to the methodology proposed by the AOAC (2007). Water activity (*A_w*) of sausages was obtained by direct reading on the device model Aqualab CX-2 (Decagon Devices, Inc., USA). All analyzes described were performed in triplicate.

2.5.2. Water holding capacity and emulsion stability

Analysis of Water Holding Capacity (WHC) of the sausages was performed according to the methodology described by Huff-Lonergan, and Lonergan, (2005). For emulsion stability (ES) was used the methodology adapted from Zorba, Gokalp, Yetim, & Ockerman, (1993). The sample was weighed (50 g), brought to baking for 1 h at 70 °C and after this time it is cooled and weighted.

2.5.3. Shear force

It was determined the shear force (SF), by a TA-XT2 texture analyzer (Stable Micro Systems Ltd., Surrey, England), controlled by computer with Warner Braztler blade, equipped with a load cell of 30 kg at a crosshead speed of 1.5 mm/s. The trigger force was set at 0.049 N, and the penetration deep was 15 mm. The sausages were cut into pieces of 2.5 cm, according to Harper, Barbut, Lim, and Marcone (2012).

2.5.4. Instrumental color

Instrumental color of the sausages was determined in Konika Minolta CR-400 colorimeter (Minolta Chromameter Co., Ltd., Osaka, Japan), in the CIELab system. L (lightness), +a* (redness) and +b* (yellowness) were measured on the inner surface of longitudinally split frankfurters from three randomly chosen spots of two frankfurters.

2.5.5. Texture Profile Analysis (TPA)

For the Texture Profile Analysis (TPA), in a TA-XT2 texture analyzer (Stable Micro Systems Ltd., Surrey, England), the sausages were cooked until internal temperature of 72° C and cut into cylinders of 1.5 cm of diameter and 2 cm wide. A double compression cycle test was performed up to 50% compression of the original portion height with a cylinder probe P/25. The measured parameter

Table 1
Formulation of Frankfurter sausages with fat replaced by hydrolyzed collagen.

Treatments				
Ingredients (%)	SS	SC25	SC50	SC75
Pork meat	35.00	35.00	35.00	35.00
Beef	30.00	30.00	30.00	30.00
Pork backfat	15.00	11.25	7.50	3.75
Hydrolyzed Collagen	–	3.75	7.50	11.25
Ice	15.00	15.00	15.00	15.00
Sodium chloride	1.80	1.80	1.80	1.80
Sodium nitrite	0.02	0.02	0.02	0.02
Sodium erythorbate	0.05	0.05	0.05	0.05
Sodium Tripolyphosphate	0.20	0.20	0.20	0.20
White pepper	0.20	0.20	0.20	0.20
Coriander	0.08	0.08	0.08	0.08
Monosodium glutamate	0.25	0.25	0.25	0.25
Garlic (powder)	0.40	0.40	0.40	0.40
Nutmeg	0.10	0.10	0.10	0.10
Onion (powder)	0.40	0.40	0.40	0.40
Starch	1.50	1.50	1.50	1.50

Download English Version:

<https://daneshyari.com/en/article/5769126>

Download Persian Version:

<https://daneshyari.com/article/5769126>

[Daneshyari.com](https://daneshyari.com)