EVALUATION OF CARRAGEENAN AS LARD SUBSTITUTE AND KCL AS PARTIAL SUBSTITUTE OF SODIUM IN SAUSAGE

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Abstract - Consumers are becoming more demanding about the quality of their food. The meat products are usually related as food causing several diseases, however due to their practicality in the preparation, are highly appreciated by consumers. The objective of this research was to evaluate the influence of KCl as a partial substitute for NaCl and carrageenan as a substitute for sausage lard. Initially a standard formulation was produced for comparison with the others. Then, the methodology of Factorial Planning was applied, in which 3 factors were evaluated: carrageenan (1-2%), potassium chloride (0,5 – 1%) and sodium chloride (0 – 0,33%), in two levels each, totaling 8 experiments. As a result, fat, moisture, ash and pH were quantified. The samples were also submitted to sensory analysis, which evaluated: color, taste, odor, texture, appearance, juiciness, overall evaluation and the intention of purchase test. As a result, the sample with 1% carrageenan, 0.33% sodium chloride and 0.5% potassium chloride was better evaluated sensorially, demonstrating that it is possible to produce a nutritionally healthier sausage with a reduction of 27, 8% fat content and 7.1% sodium chloride.

Key Words –Low fat, Healthiness, Processed meat; Low sodium.

I. INTRODUCTION

The consumption of meat products is usually related as one of the causes of health problems, among them cardiovascular diseases, obesity, cancer and hypertension. Due to the demands of consumers looking for healthier products and growing global competition, this sector seeks to develop new technologies and applications of new ingredients. Reducing fat in emulsified meat products, is extremely challenging as it clearly presents changes in appearance, texture and flavor. Some studies have been developed in this context with applications of hydrocolloids. However, when applying nondigestible gums, such as carrageenans and cellulose derivatives, the benefits to consumers goes beyond fat reduction as it increases fiber intake, reduces the risk of colon cancer, obesity and coronary heart disease [2, 3].Another problem currently related to harmful health effects is associated with excessive sodium consumption,this requires that will require the food industry to continuously reduce the use of salt in food. The major difficulties in reducing sodium in meat products are to maintain water activity by ensuring product safety, sensory properties, water retention capacity, the ability to expose and bind myofibrillar proteins, among other factors that, if not controlled during reduction or replacement, occurs the decharacterization of the products [1, 2]. In order to contribute to the provision of nutritionally healthier foods, this research aims to reduce fat and sodium simultaneously in sausage, which are components responsible for many technological and sensorial functions in the product.

II. MATERIALS AND METHODS

A standard sausage formulation was produced, meeting the requirements of Brazilian legislation to compare with the others. This compound: 50% MSM (Mechanically Separated Meat), 5.94% beef, 20% pork fat, 15% ice/water, 0.66% salt, 0.4% curing salt, 0.5% sodium tripolyphosphate, 1% condiments, 2% cassava starch, 0.5% antioxidant and 4% soy protein. Eight formulations were studied in which the lard was completely removed and the salt was reduced by 50%, besides the carrageenan (1.0 and 2.0%), NaCl (0 and 0.33%) and KCl (0.5 and 1.0%). As responses, the moisture, ash, fat and pH contents were determined in the eight formulations and in the standard formulation. These samples were also sensorially evaluated for consumer acceptance, using an acceptance test with a hedonic scale of 9 points, evaluating the attributes appearance, odor, color, taste, texture, juiciness, overall evaluation and purchase intention.

III. RESULTS AND DISCUSSION

Table 1 shows the experimental design and the results of physical chemical analyzes. Where we verify that all the samples had a reduction of the fat content when compared with the standard sample, because in their formulations

the lard was not added. The fat content that they presented came from the other components, mainly MSM. In relation to moisture, it was possible to observe that when 2% of carrageenan was added to the formulation, the humidity was 0.86% higher than when only 1% was added, because it is a hydrocolloid that has the property of retaining water. However, the moisture was reduced by 1.15% when 0.33% of sodium chloride was added to the formulation as it is a hygroscopic agent. The ashes increased as a function of increasing the addition of the inorganic compounds. The addition of 2% of the carrageenan decreased the pH of the samples by up to 0.1 when compared to the addition of 1% of the same component, since it has several sulphite chains in its composition, it was also observed that with the increase of the addition of salts there is an increase in the pH of these samples.

The S3 sample did not present significant difference in relation to the standard sample in the sensorial attributes evaluated, but it identified the limitation in the substitution of sodium chloride by potassium chloride. In relation to fat, it was possible to replace all the lard added in the standard formulation by 1% carrageenan.

Table 1: Results of physical-chemical analysis of experimental planning.

Sample	**Variables (%)**			**Car (%)**	**NaCl (%)**	**KCl (%)**	**Fat (%)**	**Moisture (%)**	**Ashes (%)**	**pH**
Standard							18±1	42,1±0,1	4,3±0,1	6,73±0,02
S1	-1	-1	-1	1	0	0,5	11,7±0,3	38,83±0,01	3,4±0,8	6,18±0,02
S2	1	-1	-1	2	0	0,5	11,0±0,3	40,0±0,1	3,0±0,7	6,24±0,04
S3	-1	1	-1	1	0,33	0,5	13±1	38,6±0,6	5,01±0,04	6,55±0,05
S4	1	1	-1	2	0,33	0,5	13,6±0,8	38,0±0,4	4,7±0,4	6,27±0,04
S5	-1	-1	1	1	0	1	12,3±0,5	39,4±0,8	5,11±0,06	6,73±0,01
S6	1	-1	1	2	0	1	12,4±0,9	42,4±0,1	5,4±0,1	6,54±0,02
S7	-1	1	1	1	0,33	1	12±1	39,9±0,9	5,38±0,08	6,62±0,01
S8	1	1	1	2	0,33	1	14,7±0,2	39,6±0,4	5,1±0,1	6,65±0,05

Legend: Car – Carragenan.

IV. CONCLUSION

It was possible to produce a sausage with a reduction of 27.8% fat and a reduction of 7.1% in the addition of sodium chloride in the formulation in relation to the standard sample. This sample met the requirements of Brazilian legislation. Carrageenan proved to be a great substitute for fat, with 1% adding enough to replace the 20% added lard in the standard formulation. Potassium chloride may be used only as a partial substitute for sodium chloride, because when it is added in greater quantity, there is a reduction in the intention to buy the samples.

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