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Journal of Nutrition and Food Processing

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Research Article

Effect of Gels on Estimating the Chemical and Physical Content of Raw and Boiled Chicken Leg Meat

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Received date: August 26, 2024; Accepted date: September 06, 2024; Published date: September 24, 2024

Citation: Firas R. Jameel, Mohammed M. Hamid and Sara T. Hadi, (2024), Effect of Gels on Estimating the Chemical and Physical Content of Raw and Boiled Chicken Leg Meat, J. Nutrition and Food Processing, 7(12); **DOI:10.31579/2637-8914/236**

Abstract:

Background: Meat in general and poultry meat in particular have special nutritional importance due to the characteristics they possess, in addition to the fact that preparation methods and additives are of great importance in determining the nutritional value, which is reflected in the desire of the consumer.

Objective: This study was conducted to determine the effect of using carrageenan in the boiling process and its effect on the physicochemical properties of chicken fingers made from chicken leg meat.

Materials and Methods: The percentage of total protein was estimated by the Kjeldahl method. were determined by the Soxhlet method using a volatile organic solvent such as hexane. Moisture was determined by drying them in an oven at 105°C until the weight was constant. The ash percentage was estimated by incineration at a temperature of 50-600°C until the weight was stable. Carbohydrates were estimated by constant weight with the rest of the components. The acidity was estimated. Physical tests estimated the separated water by calculating the difference between the weight before and after pressing. The loss in boiling was estimated by calculating before and after boiling the weight difference

Results: Adding carrageenan at a rate of 2.5% reduced fat, protein, and moisture and increased the percentage of ash in the samples before the boiled process. If adding carrageenan leads to a decrease in water loss through the boiling process. If it increases the product's ability to bind water and carrageens, it increases consumers' acceptance of the final product.

Conclusion: The results showed a slight significant increase in the percentage of ash, fat, and salt for the boiled and processed samples after adding carrageenan, and a decrease in the protein and acidity percentage for both the raw and boiled samples.

Key words: carrageenan, chicken fingers, chicken leg (drumstick), chemical properties, physical properties.

1. Introduction

The increase in animal protein, especially red meat, and as a result of the shortage of quantities needed to meet the needs of societies, especially in developing countries, led to a decrease in the per capita share [1].
Meat is considered one of the main products that humans rely on for nutrition in order to obtain meat as food. Technical progress in methods of preserving meat and speed of transportation has contributed to the prosperity of the meat industry and trade between countries, making it possible to slaughter animals in one country and consume it in other countries [2].

The shortage of animal protein has called research centers to work on introducing new and cheap materials (such as carbohydrates) into the meat industry with the aim of increasing productivity and obtaining cheap products with good specifications from a chemical, sensory and physical standpoint, such as carrageenan, starch and others.
Meat is considered a group of muscle, connective, and fatty tissue, in addition to some glands and internal organs such as the liver, heart, spleen, tongue, kidney, brain, and others. Meat is taken from edible animal carcasses, provided that it is free of pests and diseases. Proteins range from 18-22%. It contains essential amino acids and soluble vitamins. In fats A, D, E, and K, A group of vitamins C and B in processed meat products contain mineral salts between (0.8-1.2)%, the most important of which are potassium, phosphorus, and iron, and a smaller percentage is the result of addition during manufacturing [3]. The

prosperity of white meat is due to the establishment of large and specialized farms. Processed meat is considered one of the most important products in which the properties of fresh meat are determined using one or more manufacturing methods such as chopping, crushing, emulsifying, salting, adding flavours, heat treatment, smoking and fermentation. Burger products, meatballs and fingers have recently spread. Meat, sausage, etc. These products are considered a favorite among children because they have good taste and high nutritional value.

Carrageenan is a natural extract of many marine red algae and is used as a thickener and thickener that helps form jelly [4]. Overall, the objectives of the present experiment were to evaluate the effects of Carrageenan on the chemical content and physical properties of chicken meat fingers is the effect of the boiling process on the chemical content.

2. Material and methods:

2.1. experiment design

I took a chicken drumstick and stripped the meat from it with 20% fat. It was ground using a meat grinding machine with 3 mm holes and salt was added to it. It was left in the refrigerator for 12 hours at 4°C to complete the salting process. Then it was divided into two equal parts and the mixtures were prepared from it.

The first mixture, control A: was made and only spices were added to it.

Second mixture B: prepared with the same ingredients as the previous mixture, with the addition of 2.5% carrageenan of the total weight.

After mixing the ingredients, they were left in the refrigerator for a period of time until the consistency stabilized, then they were prepared in the form of fingers weighing 20-25 grams, then boiled at 90°C for 30 minutes.

2.2. Chemical and physical tests

The percentage of total protein was estimated by the Kjeldahl method by digesting the samples with concentrated sulfuric acid with heating. The distillation process was performed and the distillate was received in a volumetric flask containing 3% boric acid, after which it was titrated in the presence of the reagent [5]. were determined by the Soxhlet method using a volatile organic solvent such as hexane [6]. Moisture was determined by drying them in an oven at 105°C until the weight was constant [7]. The ash percentage was estimated by incineration at a temperature of 50-600°C until the weight was stable [8].

Carbohydrates were estimated by constant weight with the rest of the components. The acidity was estimated by titration with 0.1 M sodium hydroxide using the phenonphthalein index according to the total acidity based on lactic acid [9].

Physical tests estimated the separated water by calculating the difference between the weight before and after pressing the 1 kg sample for 10 minutes [10]. The loss in boiling was estimated by calculating before and after boiling the weight difference [11,12].

Sensory tests: include color, taste, smell, and texture [13].

Statistical analysis: Statistical analysis was conducted by calculating the value of the least significant difference (L.S.D.) at a significant level of 0.05 using the Anova program [14].

3. Result and discussion:

Table 1 shows that the percentage of protein is 19.8%, fat is 4.01%, moisture is 74.1%, and ash is 1.3%. The percentages are close [15]. The slight difference between the components of the meat from one sample to another is due to age, nutrition, gender, and other factors that affect the chemical composition of the meat [16].

No	ingredients	percentage
1	protein	19.8
2	fat	4.01
3	moisture	74.1
4	ash	1.3

Table 1: Chemical content of broiler leg meat used in manufacturing

Table 2 shows the presence of a significant increase at $p<0.05$ levels of acidity decrease in the sample to which carrageenan was prepared hot under strong conditions [17]. The humidity in the control sample reached 62.11% and in the sample to which carrageenan was added 59.90%. Therefore, the decrease in humidity in the sample to which carrageenan was added Carrageenan is due to the addition of a dry carbohydrate, which led to a decrease in the moisture content in the samples based on the total weight [18].

As for protein, there was a slight decrease in the manufactured sample to which carrageenan was added compared to the control sample. Fats increased in the control sample and decreased in the sample to which carrageenan was added, due to the carbohydrates present in carrageenan, if it contained 4.01%. This is because it is marine algae treated with alkali in the form of salts. Sodium or calcium [19]

Sample	Acidity	moisture	protein	fat	ash	CHO
Control	0.29a	62.11a	19.01a	17.90a	3.02	--
Sample with2.5% carrageenan added.	0.24b	59.90b	18.21b	17.30b	4.01a	1.45a

Similar letters indicate that there are no significant differences between the studied samples

Table 2: General chemical content of the raw sample before boiling

Table 3 shows the chemical composition of the samples after the boiling process. The decrease in the percentage of moisture in the boiling sample after boiling compared to before boiling is due to the percentage of carrageens, which have the ability to retain water because they are thickeners and thickeners and have the ability to absorb moisture [20,21]. The protein in boiled samples was lower than in raw ones due to the loss of nitrogenous substances during boiling [22]. The percentage of ash in boiled samples was lower than in raw ones due to the loss of part of the mineral elements in the boiling water. However, for carrageenan, the loss was less than in the control sample due to the binding of carrageenan to the mineral elements, which Reduces the rate of loss of boiling water. As for fat, the loss in raw samples was greater than in boiled samples if carrageenan worked to reduce fat loss because it acts as an emulsifier, which gave relative stability and stability to the emulsion [23]. Decrease in acidity in the boiled sample due to the loss of organic acids in the boiling water.

Texture is considered one of the factors of the sensory quality of meat, expressing its freshness, and gives an idea of the tenderness and juiciness of the meat and its ability to bind water, which is considered one of the most important qualitative characteristics of meat and its products [24].

NO	Treatment	ASH	Fat from relative weight	FAT	Protein from relative weight	Total protein	moisture	Acidity
1	Control sample	1.82b	9.40b	12.42b	17.92a	24.40a	59.99b	0.21a
2	Chicken fingers made with 2.5% carrageenan added	2.78a	10.99a	13.21a	17.58b	22.58b	60.28a	0.18b

Table 3: Chemical content of boiled samples

Similar letters indicate that there are no significant differences between the studied samples

It is clear from Table 4 that carrageenan reduced the loss during the boiling process compared to the control sample, because carrageenan has the ability to form gels at high temperatures, which contributed to binding the components of the final product and reducing the loss of various components during the boiling process. It is considered a stable substance in Alkaline and moderate solutions or thermally stable [25] and carrageenate is considered a substance that binds strongly to water.

NO	Treatment	Loss in blanching %	Percentage of bound water by total weight in raw samples
1	Control	32.98a	83.01b
2	Chicken fingers with 2.5% carrageenan added	25.88b	89.54a

Similar letters indicate that there are no significant differences between the studied samples

Table 4: Percentage of bound and lost water in boiling water

Table 5 shows that chicken fingers to which carrageenan was added excelled in sensory characteristics in terms of texture and taste and received the highest rating from tasters compared to the control sample to which nothing was added (control sample) [26,27]

NO	Samples	color	juicy	favor	Taste
1	Control	4.88	3.35	4.32	2.96
2	Chicken fingers with 2.5% carrageenan added	4.80	3.36	4.68	3.32

Similar letters indicate that there are no significant differences between the studied samples

Table 5

4. Conclusion

We conclude that adding carrageenan had an effect on the chemical content of raw and processed chicken meat fingers if it increased the percentage of mineral elements, so it was close to the control sample. The boiling process affected the chemical content of chicken meat fingers if this led to a loss in fat, and that carrageenan increased the percentage of the product over Binding with water and reducing losses during the boiling process. Carrageenan increased the ability to bind water and reduced water loss during the boiling process. It had a positive effect on the consistency of the product and the stability of the emulsion, thus reducing the loss of fat and the sensory properties of the final product.

Abbreviations: mm: measuring unit, gm: gram, ml: milam, °C:Celsius degree.

Authors Contribution: Firas Riyadh Jameel: Formal analysis; Methodology; Project administration; Funding acquisition; Validation; Writing original draft. Mohammed Majed Hamid: Data duration; Formal analysis; Methodology; Sara Thamer Hadi: Project administration; Supervision; Resources; Validation; Writing review and editing.

Competing Interests: The authors declared no conflict of interest.

Acknowledgment/Funding: The authors would like to acknowledge the contribution of the University of Anbar (www.uoanbar.edu.iq) via their prestigious academic staff in supporting this research with all required technical and academic support.

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DOI:10.31579/2637-8914/236