Effect of Chickpea Flour Addition

(*Cicer Arietinum L.*) in Cooking Losses During Empty Frying of Chorizos

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Abstract

The purpose of this study was to analyze the effect of chickpea flour (*Cicer Arietinum L.*) on cooking during chorizos frying. For this purpose, four treatments were evaluated: T1, T2, T3 and T4 with incorporation of chickpea flour at 0%, 3%, 6%, and 9%, respectively. The sensory evaluation was carried out with 30 untrained panelists. It was reported that the best degree of acceptance of color, odor and fattyness was for T4 (9%), and for the taste it was T1. All the options for the reduction of the rice crop of the chickpea flour added to the high protein content, results in water by cooking.

Keywords: *Cicer arietinum* L., cooking losses, sensory evaluation

1. Introduction

According to data from DANE, in Latin America, Colombia is the third country
with world production of beef. Within the diet of a large part of the population in the world, meat is considered as the main source of protein [1]. The consumption of this one, is absolutely fundamental in the nutrition since it is part of all the tissues of the organism, they are in charge of elementary and important activities for the development [2], however, in Colombia the deficient of protein intake reaches 36%, which means that the recommended daily intake (0.91 g / kg of weight) is not satisfied in a large sector of population [3]; this deficiency has a greater impact on children, because their protein and energy needs per kilogram of body weight are higher and their vulnerability to infection is higher, which increases protein and energy requirements especially [4]. The high cost of protein-rich foods mainly affects the stratum population 0 and 1, so many researchers have reported the importance of using non-meat ingredients such as cereals, legumes, and fruits (rich in protein and carbohydrates) to improve this problematic In order to reduce production costs, some substances have been used in the formulation of meat products (as additives or substitute), called "extenders" [5]. The purpose of replacing part of the animal protein with vegetable protein is to increase the utilities and offer a product with proteins of high biological value and adequate functionality [5]; it should be noted that the incorporation of meat extenders is not always to replace part of the animal protein, but also to replace much of the fat contained in the product.

The flours, concentrates and isolates of cereals and legumes are examples of meat extenders most used in the food industry; they have functional properties such as water retention, emulsification of fats, absorption of lipids and gelation [6]. Among them is the chickpea (Cicer arietinum L.), a plant of the legume family, whose seeds are used both in human food and farm animals. There are two types of chickpeas: kabuli and desi, morphologically they are different; Kabuli forms long pods, corrugated seeds, and they are usually honey-colored, and the desi variety are brown, and their seeds smaller [7]. It is a legume rich in proteins (23-24%) and starch (36-41%), with readily available energy [8]. The functional properties of chickpea flour include its water retention capacity, emulsifying capacity, ability to form gels, and ability to form foam [7]. Therefore, the objective of this investigation was to analyze the effect of the addition of chickpea flour (Cicer Arietinum L.) on cooking losses during empty frying of Chorizos.

2. Methodology

Chickpea grains, meat and non-meat ingredients were obtained from a supermarket in the city of Cartagena de Indias, Colombia, and were transferred to the Food Engineering pilot plants of the University of Cartagena Piedra de Bolívar Headquarters.

2.1 Flour preparation
To obtain the flour, the grains (already dry) were selected taking into account that
they were healthy (whole and without weevil bites). Then they were milled in a traditional mill, posing as a No. 40 mesh sieve until obtaining a fine flour [9].

2.2 Chorizos preparation

To carry out the four treatments, the meat was first chopped, then ground in a stainless steel mill, CRT brand. According to the weight of ground meat and pork fat, the formulation of the ingredients was made (Table 1). Later the meat and the non-meat ingredients were mixed, then it was stuffed, and they were blanched until reaching an internal temperature of 75 °C, once this happened, a thermal shock was carried out and they were stored in ziploc bags to avoid the loss of humidity. Finally the chorizos were kept in refrigeration for 18h for later sensory analysis.

<table>
<thead>
<tr>
<th>Raw Material</th>
<th>Control T1 (%)</th>
<th>T2 (%)</th>
<th>T3 (%)</th>
<th>T4 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beef</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Pork Bacon</td>
<td>15</td>
<td>12</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>C. arietinum Flour</td>
<td>0</td>
<td>3.0</td>
<td>6.0</td>
<td>9.0</td>
</tr>
<tr>
<td>Ice</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
</tr>
<tr>
<td>Chorizo seasoning</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pepper</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Liquid Smoke</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Scallion</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Garlic</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Nitrite</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Polyphosphate</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Ascorbic Acid</td>
<td>0.045</td>
<td>0.045</td>
<td>0.045</td>
<td>0.045</td>
</tr>
</tbody>
</table>

2.3 Sensory evaluation

The analysis was carried out with 30 untrained panelists from the University of Cartagena. The 5-point hedonic scale test was applied (I dislike it a lot, I dislike it, I do not like it or dislike it, I like it, and I like it a lot) to evaluate sensory characteristics such as taste, color, smell, crunchiness, and fattyness; similar to what has been done by Torres et al., [6]. The test was conducted in an area with good lighting and pleasant temperature, factors that did not affect the perceptions of the sensory characteristics of chorizos. Disposable plates marked with the different samples (T1, T2, T3 and T4), containers with water, toothpicks and napkins were used; the samples delivered were fried superficially. Prior to the tasting, the panelists were told what the test was about and how they should use the delivered format.
2.4 Cooking Losses

After cooking (blanching) and heat shock the chorizos were allowed to stand. Cooking losses were calculated as the percentage difference in weight between samples of chorizo before blanching (fresh) and cooked in relation to the weight of fresh chorizo samples. It was calculated with equation 1 [10]. This analysis was performed for each treatment.

\[
PPC = \frac{weight\ of\ raw\ chorizo - weight\ of\ cooked\ chorizo}{weight\ of\ raw\ chorizo} \times 100
\] (1)

2.5 Analysis of data

To analyze the results of the different formulations, the analysis of variance (ANOVA) was applied to establish if there were significant differences between the variables and with the 5% Tukey HSD multiple comparisons test. All data were expressed as the average with its standard deviation, performing each treatment in triplicate. The statistical analysis was carried out with the Statgraphics Centurion program (version 16.2.04, StatPoint Technologies Inc., USA).

3. Results

3.1 Sensory evaluation

In Table 2, the average results of the sensory evaluation of the treatments with incorporation of chickpea flour and the control sample are reflected, observing that T1 (control sample) and T4 (9%) presented the highest acceptance values for the color, indicating that the addition of chickpea flour was accepted, because it did not modify the color characteristic of chorizos [11].

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Color</th>
<th>Odor</th>
<th>Flavor</th>
<th>Crunchiness</th>
<th>Fattyness</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>3.80 ± 0.71</td>
<td>3.70 ± 0.65</td>
<td>3.93 ± 0.78</td>
<td>3.20 ± 0.96</td>
<td>3.23 ± 1.07</td>
</tr>
<tr>
<td>T2</td>
<td>3.63 ± 0.76</td>
<td>3.63 ± 0.80</td>
<td>3.73 ± 1.04</td>
<td>3.26 ± 0.86</td>
<td>3.10 ± 1.06</td>
</tr>
<tr>
<td>T3</td>
<td>3.70 ± 1.08</td>
<td>3.33 ± 1.02</td>
<td>3.73 ± 1.05</td>
<td>3.43 ± 0.97</td>
<td>3.10 ± 1.21</td>
</tr>
<tr>
<td>T4</td>
<td>3.83 ± 0.87</td>
<td>3.80 ± 0.84</td>
<td>3.66 ± 1.12</td>
<td>3.20 ± 1.12</td>
<td>3.76 ± 0.97</td>
</tr>
</tbody>
</table>

The perception of flavor decreased as the chickpea flour content increased, unlike Torres et al., [6] and Hernández and Güemes [12], who reported that the flavor values increased when the flour content of Lens culinaris verdina variety and orange peel meal in sausages increased, respectively. In the present study, it was
Effect of chickpea flour addition (Cicer Arietinum L.) ... observed that the effect of chickpea flour incorporation prevailed in the possible acceptance of chorizo, since the different percentages used (3%, 6% and 9%) affected one of the most important criteria for endorse a new product with sensory quality. Regarding the crocancia, it was observed that the values were similar, with a higher acceptance of the T3 treatment, possibly the intermediate content of chickpea flour. On the other hand, the effect of the incorporation of 9% chickpea flour (T4) on the degree of acceptance was effective for color, odor, and good perception of fat; however, it presented the lowest values in comparison with the other treatments in terms of flavor and crunchiness.

3.2 Cooking Losses

It is evident that the addition of chickpea flour influenced the loss by cooking the sausages made. The treatment that had less weight loss was the T3 treatment, that is; with 6% flour is enough to obtain the best result. A higher percentage of addition of flour, cooking losses are increasing and are similar to the control treatment, this was similar to that reported by Hleap-Zapata et al., [13], who reported higher weight losses as they increased the content of wheat flour and quinoa in sausages. The low cooking loss is due to the water retention capacity (CRA) of the myofibrillar protein in meat, in addition to meat extenders such as flour. It can also be indicated that the high CRA of the flour is possibly due to the presence of hydrophilic compounds and the protein content [7].

<table>
<thead>
<tr>
<th>Treatments</th>
<th>T1 (%)</th>
<th>T2 (%)</th>
<th>T3 (%)</th>
<th>T4 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooking Losses</td>
<td>5.37 ± 0.26d</td>
<td>4.23 ± 2.3b</td>
<td>1.57 ± 0.8a</td>
<td>5.26 ± 0.9c</td>
</tr>
</tbody>
</table>

4. Conclusion

The addition of chickpea flour in chorizos can have beneficial effects on the degree of acceptance by consumers. The best results in aspects such as color, odor, and fattyness were T4 (9% chickpea flour); and T3 in terms of flavor (6% chickpea flour), presenting greater acceptance. All treatments had significant statistical differences for cooking losses; that is, chickpea flour influenced this characteristic, obtaining better results T3 treatment. The use of chickpea flour in meat sausages can be beneficial for both the consumer and the food industry, obtaining proteins of high biological value and affordable costs.

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References


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