Chestnut flour addition influence on bread quality

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Abstract

The goal of this study is the evaluation of enriched bread prepared with an addition of chestnut flour. This paper belongs to a more complex study, which aims obtaining some bread assortments with high nutritional value, and improving their rheological features, by adding chestnut flour that successfully replaces the dyes and flavor substances, used in bakery. The following analysis were performed on bread, in this regard: sensorial, physio-chemical analysis and of rheological tests with 5%, 10% and 15% chestnut flour addition, respectively.

Organoleptic analysis showed that the chestnut flour in a 10% led to a bread with the best features of taste, color and odor. Corroborating the results for physico-chemical and organoleptic analysis was chosen as the best option the bread with the mixture of 90:10 mass ratio (white flour: chestnut flour).

Keywords: breast cancer, diet, nutrients, health, fat, weight

1. Introduction

Bread is one of the most important food products, being necessary for daily feed for its nutritive value and for its content of energizing substances [1-3].

The assortment of bakery products can be classified taking into account more systematic criteria such as: the nature and quality of the flour, qualitative-quantitative composition of the flour / grain mixtures, the addition of ingredients and technological system, the type of the bread making, the shape and appearance of the products, the nutritional value and destination of the products [1-4].

There have always been contradictory opinions about the variety of bakery products. Some specialists consider that the present market of bakery products has a wide assortment, while others consider that the range of bakery products offered for consumption is much more narrow compared to some of the previous periods of time and current production possibilities. Although currently all over the world there is consumed tens of thousands of varieties of bakery products, assortment diversity is comparable to that of antiquity. Only in Mesopotamia and ancient Egypt the bread was prepared in 5-10 thousand varieties [2-11].

Specialists’ present preoccupation are related with obtaining baking products with superior quality, loosened, with pleasant taste and flavor, with long-lasting shelf-life, with high nutritive value, but also correction on bread or bread products imperfections [12]. Also the orientation of food producers to traditional, natural and healthy products is a nowadays fact [13,14].

Considering these issues, the aim of this paper was to obtain some high nutritional value bread assortments, and also to improve these rheological (texture) features, by chestnut flour addition.

The use of the chestnut flour as addition in common bread preparing, is justified starting from the complex composition of these: carbohydrates...
(78%), proteins 6.6%), fats (3.1%), vitamins (B1, B2, B3) and microelements (potassium, iron, calcium) [15].

2. Materials and Method

2.1. Bread obtaining technological process. The recipe used for obtaining chestnut flour bread, was the following one: flour 1000 g, water -50%, yeast – 3%, salt –1.5%, and chestnut flour addition in various amounts: 5%, 10% and 15%, respectively. Similarly, a control sample without chestnut addition was performed.

After the fermentation period, the dough was divided into two equal parts, it was modeled and baked. The optimum parameters of the technological process were: kneading 10 minutes/28ºC, fermentation 80 minutes/30ºC, baking 40 minutes at 180ºC.

2.2. Chestnut flour bread quality evaluation

Bread sensory analysis. The bread obtained after the above described method was submitted to the sensory exam, as following: the external appearance, crumb state and aspect, flavor, taste, microbial alteration signs and impurities presence (according to STAS 91-83 „Bread, loaf products and bakery specialties. Analysis methods”).

Bread physio-chemical and rheological analysis. Also, the bread obtained after the above described method, was submitted to the physio-chemical and rheological exam, as following: the product volume, crumb porosity and elasticity, height/diameter ratio, moist, acidity and salt content (according to STAS 91-83 „Bread, loaf products and bakery specialties. Analysis methods”).

3. Results and Discussion

The chestnut flour addition improved the sensory and rheological parameters of the bread.

3.1. Chestnut flour supplemented bread sensory evaluation

The bread obtained according to the paragraph 2.1, showed the following sensory features (Table 1) which are in accordance with STAS 91-83.

The organoleptic evaluation of the bread revealed that as the portion of chestnut flour was increased, the bread crust colour changed from light brown to chestnut brown. The crust texture, flavour and taste also changed. Taking into account the overall acceptability rating, it was concluded that bread with an addition of up to 15% of chestnut flour could be baked with satisfactory results. Following the data analysis, it can be said that in all cases in which chestnut flour was added, the obtained products’ height and diameter were proportional (different for each assortment), the volume-visual appreciated was higher than the control sample volume, the products were not excessively flattened or curved.

Chestnut flour is not commonly used as a bakery raw material because there is no glutenin and gliadin fraction for gluten formation. The influence of the addition of chestnut on dough processing and on the quality of the baked goods was observed. The rheological properties of dough changed when the amount of chestnut flour in the blend was increased.

3.2. Chestnut flour supplemented bread physio-chemical evaluation

The results interpretation through graphic representation at bread obtained according to the paragraph 2.1., have permitted us to obtain certain information concerning the optimal chestnut flour addition. The experimental influence of chestnut flour addition on studied characteristics of dough and bread are graphically presented in Figure 1 – for bread humidity, in Figure 2 – for bread acidity, in Figure 3 – for bread NaCl, in Figure 4 – for bread elasticity, in Figure 5 – for bread porosity, and in Figure 6 – for H/D ratio.
From Figure 1, it can be observed that bread humidity linearly decreases with chestnut flour addition increasing, with a good linear correlation ($r = 0.8864$) between bread humidity and chestnut flour. The determination coefficient ($R^2$) calculated shows that the total variation of bread humidity 78% is determined by the variation of chestnut flour addition.

Table 1. Chestnut flour supplemented bread sensory features

<table>
<thead>
<tr>
<th>Analysed sensory feature</th>
<th>Recorded sensory features</th>
</tr>
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<tbody>
<tr>
<td>Aspect</td>
<td>- shiny, developed surface, without flattening, without cracks;</td>
</tr>
<tr>
<td>Color</td>
<td>- brownish, characteristic to the analyzed assortment;</td>
</tr>
<tr>
<td>Appearance to the core</td>
<td>- the crumb is characteristic to the analysed assortment;</td>
</tr>
<tr>
<td></td>
<td>- uniform, with fine pores, no gaps greater than $2 \times 3$ cm;</td>
</tr>
<tr>
<td></td>
<td>- elastic, when easy pressed accrues to the initial shape, well baked crumb.</td>
</tr>
<tr>
<td>Taste and flavor</td>
<td>- pleasant, aromatic, characteristic to well baked product</td>
</tr>
<tr>
<td>Microbial alteration signs</td>
<td>- upon bursting no mucilaginous filaments are formed</td>
</tr>
</tbody>
</table>

It can be observed from Figure 2 that there is a marginal linear correlation between bread acidity and chestnut flour addition ($r = 0.1414$).

The determination coefficient ($R^2 = 0.02$) indicates that for analyzed breads, from total variation of bread acidity only 2% can be attributed to chestnut flour addition.

In Figure 3, the graphically relationship between NaCl and chestnut flour addition is represented. The determination coefficient ($R^2$) calculated indicates that from total variation of bread NaCl, 60% is determined by the variation of chestnut flour addition.

Figure 2. The influence of the chestnut flour addition on bread acidity

Figure 3. The influence of chestnut flour addition on NaCl
It can be observed from figure 4 that the chestnut flour addition has a positive influence on the porosity. There is a very good linear correlation \( r = 0.9149 \) between porosity and chestnut flour addition. The determination coefficient \( R^2 \) has high values, 0.8371 which means that the bread porosity variation is determined in proportion of 83\%, by the chestnut flour added.

\[ y = -6.41x + 71.95 \]
\[ r = 0.9149 \]
\[ R^2 = 0.8371 \]

Figure 4. The influence of the chestnut flour addition on bread porosity

In Figure 5 it can be observed that the chestnut flour addition has a positive increasing influence on bread’s crumb elasticity. There is a very good linear correlation \( r = 0.7980 \) between porosity and chestnut flour addition. Determination coefficient \( R^2 = 0.6368 \), shows that 63\% of bread’s crumb elasticity variation is influenced by chestnut flour addition.

\[ y = 3.3x + 81.65 \]
\[ r = 0.7980 \]
\[ R^2 = 0.6368 \]

Figure 5. The influence of chestnut flour addition on bread’s crumb elasticity

Flour mixture: the chestnut flour 90:10 (% v:v) resulted in obtaining the best bread characteristics of taste, color, odor. Porosity, elasticity, the ratio H/D, humidity, acidity and % of salt recorded values falling within the STAS values for all experimental variants.

4. Conclusion

From the experimental dates, which were obtained, we can draw the conclusion that the chestnut flour favorably influences the quality of bread.

Organoleptic analysis showed that the mixture white flour - chestnut flour with 90:10 mass ratio led to a bread with the best features of taste, color and odor.

Porosity, elasticity, the ratio H/D, humidity, acidity and % of salt recorded values falling in value STAS, for all variants experimentale.

Corroborating the results for physico-chemical and organoleptic analysis, the bread with the mixture of 90:10 mass ratio was chosen to be the best option (white flour: chestnut flour).

Also, 10\% chestnut flour addition has the best influence on the elastic properties of the bread crumb.

Thus, the experimental data suggest that chestnut flour addition can be successfully used in bakery.
References


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