

THE EFFECTS OF RADIOFREQUENCY HEATING ON THE AMINOACIDS CONTENT OF WHOLE WHEAT BREAD, GRAHAM BREAD AND WHITE BREAD

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Abstract—In this study, it was determined the content of some amino acids from 3 types of wheat based bread: White, Whole Wheat and Sylvester Graham before and after RF treatment. The amino acids content was monitored at two different moments: T0- initial moment and at T10- after 10 days of storage at in controlled conditions. The main conclusion of this preliminary study was that treatment with RF at 100°C does not affect the nutritional value of the core regarding the content of analysed amino acids. Further it is necessary to be studied the effects of RF treatment over the general nutritional profile of the samples.

Keywords: amino acids content, radiofrequency treatment, whole wheat bread, graham bread, white bread, nutritional value.

1. INTRODUCTION

Bread is one of the most popular and important food products in many countries due to its significant nutritional, sensory, and textural characteristics [1] but it has a relative short- life. In the past the key role for bread was the simple provision of energy, but in more recent years the role that wheat-based products play in delivering additional nutritional benefits has become more prominent. Such benefits include the provision of fiber and essential nutrients beyond the simple value of protein and carbohydrate [2]. Several methods can be applied for extending shelf-life of breads concerning both recipe formulation and

storage conditions [3]. One of these methods is radiofrequency treatment and the results are promising and show that RF heating represents a good perspective for increasing shelf life of tested types of bread but the effects on nutritional value of the treated products are not well established.

2. EXPERIMENTAL

2.1. Bread samples

There were used three types of bread: White bread, Whole Wheat bread and Sylvester Graham bread. The samples had a thickness of 7 cm, a height about 8 cm and they were packed individually.

2.2. Radiofrequency treatment

To develop RF treatment protocols were used a 27.12 MHz RF laboratory system. To evaluate the possible undesirable effects of the treatment on the amino acids content of product, the samples were heated until was reached the temperature of 100°C in the centre of the product. For each sample were used two replicates.

2.3. Amino acids determination method

The method is based on determination and quantification of amino acids by ion-chromatography with amperometric detection and concentration gradient, which does not require

additional preparation of the samples (derivatisation) after the hydrolysis, has been completed. The amino acid identification and quantification was performed using a Dionex ICS3000 system (Figure 1) consisting of: autosampler, detector, dual pump, eluent distributor, and computer with the Chromeleon 6.80 software.



Figure 1. Ion-Chromatograph ICS3000 (Dionex)

3. RESULTS AND DISCUSSION

The samples were evaluated at two different moments: T0- initial moment (control and treated samples at 100°C) and T10 – after 10 days from the treatment (control and treated samples at 100°C) in order to observe the effects of the radiofrequency treatment on the amino acids content.

The samples were encoded accordingly: white bread: P1-control, T0; P2- sample treated at 100°C, T0; P1*- control, T10; P2*- sample treated at 100°C, T10; whole wheat bread: P3-control, T0; P4- sample treated at 100°C, T0; P3*- control, T10; P4*- sample treated at 100°C, T10; graham bread: P5-control, T0; P6- sample treated at 100°C, T0; P5*- control, T10 and P6*- sample treated at 100°C, T10.

The aminoacids determined were: Arginine (ARG); Lysine (LYS); Alanine (ALA); Methionine (MET); Histidine (HIS); Phenylalanine (PHE); Glutamic acid (GLU); Aspartic acid (ASP); Cysteine (CYS) and Tyrosine (TYR).

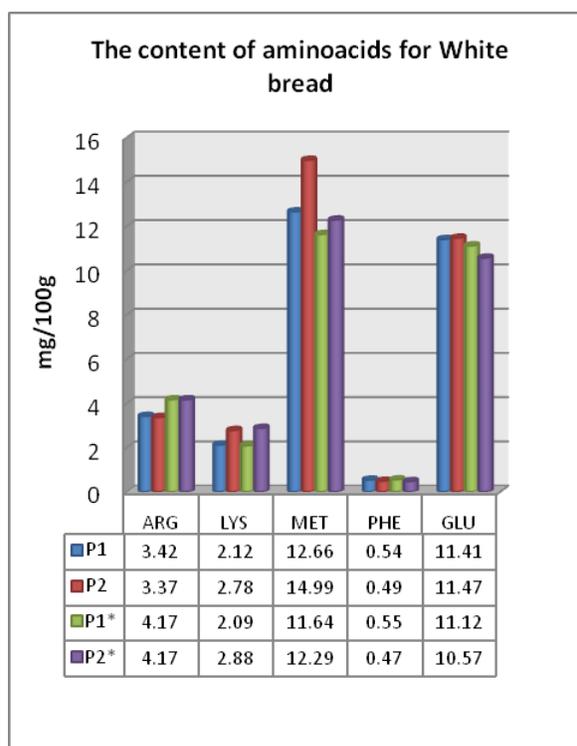


Figure 2. The values for the aminoacids present in White bread

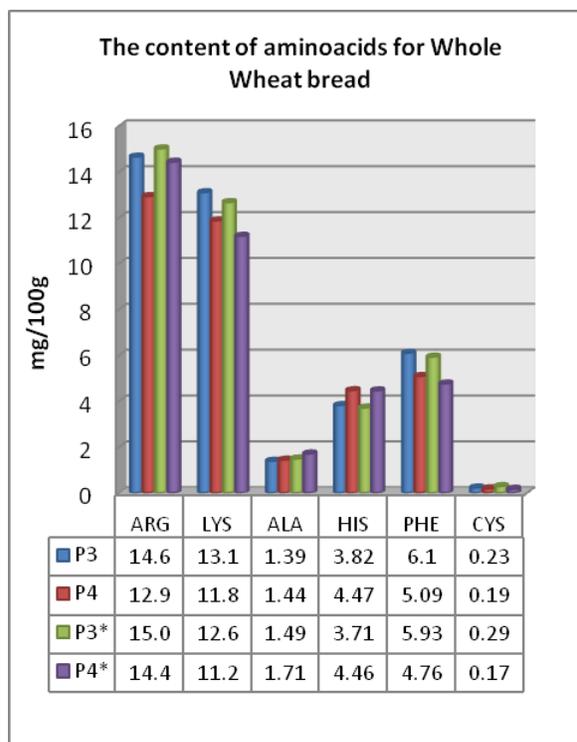


Figure 3. The values for the aminoacids present in Whole Wheat bread

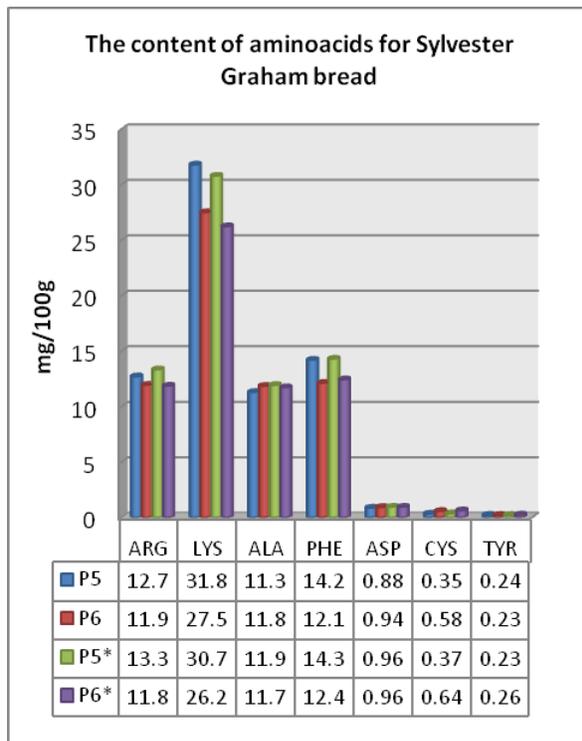


Figure 4. The values for the aminoacids present in Sylvester Graham bread

From the figures 2,3 and 4 it can be observed three main aspects:

(i)- the number of amino acids determined increased with the increase in the degree of extraction applied in the grinding process to obtain the flour, thus: White bread - 5 amino acids - arginine, lysine, methionine, phenylalanine and glutamic acid; Whole Wheat bread- 6 amino acids arginine, lysine, alanine, histidine, phenylalanine and cysteine; Sylvester Graham bread - 7 amino acids - arginine, lysine, alanine, phenylalanine, aspartic acid, cysteine and tyrosine.

(ii)- the amount of amino acids also showed a proportional growth trend with inclusion of the outer layers of wheat grain in the milling, white flour being the poorest in amino acids.

(iii)- Amino acid content did not show major changes by comparing the control sample with radiofrequency wave treated sample and comparing the analysis moments between them.

4. CONCLUSIONS

Studies were conducted to evaluate the effects of RF heating on nutritional profile of the treated types of bread. Analysing the results of the determination of the amino acid content it was observed that all the amino acids in the analysed samples could not be quantitated; this may be due to oxidation of some amino acids during sample preparation, as well as insufficient separation. Preliminary measurements indicated the differences between control and bread samples after RF treatment were insignificant, so the influence of the treatment did not change the amino acid content and also does not influence the nutritional characteristics of the product.

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