

THE IMPACT OF THE APPLIED METHOD ON THE CONTENT OF ANTIOXIDANTS IN SPIRULINA, GLUTEN-FREE PRODUCTS

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The aim of the research is to elaborate gluten-free bakery products with an increased functional and nutritional value through the contribution of phytonutrients derived from microalgae; as well as to determine the impact of the obtaining method on the antioxidant content in the finished product.

The objective of the study is to formulate bakery products – breadsticks from gluten-free rice and sorghum flours fortified with *Spirulina platensis* biomass, through two processes: the single-phase method, with a chemical loosening (sodium bicarbonate), and the biochemical method (with compressed baking yeast). The following recipes have been developed: Breadsticks from rice flour (R), Breadsticks from rice flour with addition of 6% of spirulina (RSp), Breadsticks from sorghum flour (S), Breadsticks from sorghum flour with addition of 6% of spirulina (SSp). Recipes of fermented products, from leavened dough have also been developed: Breadsticks from rice flour (FR), Breadsticks from rice flour with addition of 6% spirulina (FRSp), Breadsticks from sorghum flour (FS), Breadsticks from sorghum flour with addition of 6% of spirulina (FSSp). The quality indicators of the gluten-free flours, along the nutritional and functional character of the products and the physicochemical indicators of the experimental samples were determined: moisture content, water activity a_w , ash content, fat content, total fiber content, acidity content, sugar content (theoretical), color/chromatic parameters, sensory properties (as per a scoring scale) and the energetic value. The total content of the phenolic compounds (TPC) in the final products was determined by the spectrophotometric method, using the Folin Ciocalteu reagent, and expressed in gallic acid equivalents per gram of sample ($\text{mg GAE}\cdot\text{g}^{-1}$). Research has shown that the obtained gluten-free products have a low TPC. When fortifying the breadsticks with biomass of spirulina, TPC increases in all samples, compared to the spirulina free samples. The highest TPC was detected in the breadsticks elaborated by the single-phase method, as follows: R - 0.123 ± 0.03 ; RSp - 0.333 ± 0.02 ; S - 0.168 ± 0.02 ; SSp - 0.393 ± 0.01 $\text{mg GAE}\cdot\text{g}^{-1}$. The addition of 6% of microalgae biomass to the finished products with a chemical loosening led to a 2.5-fold increase of the TPC. The breadsticks obtained from fermented dough have a much lower amount of TPC, as follows: FR - 0.003 ± 0.001 ; FRSp - 0.003 ± 0.002 ; FS- 0.048 ± 0.002 ; FSSp - 0.063 ± 0.001 $\text{mg GAE}\cdot\text{g}^{-1}$, probably due to the interaction of polyphenols with the substances resulting from the fermentation process.

Research has shown that the addition of 6% of spirulina biomass to the finished products improves their physicochemical and nutritional properties, texture and color, if compared to the control samples. Withal, TPC in breadsticks with and without addition of spirulina, formulated with a chemical loosening (sodium bicarbonate), is significantly higher, compared to TPC in breadsticks from leavened dough

Keywords: dietary products, gluten-free breadsticks, microalgae, phenolic compounds.

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