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The Use of Mixolab to Predict the Quality of Wheat Flour Partially Substituted by Soursop Residues Flour for Bread Production through a Process Mixture Design

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Abstract: Industrial engineering has a wide range of applications, one of them is food science. Ecuador is one of the countries with the highest development in soursop crops; however, as this fruit represents a promising market to the country, organic waste is becoming a major problem. To reduce the amount of organic waste and to add value to the residues, functional food products are developed, such as bread. A partial substitution of wheat flour by soursop residues flour may have beneficial effects on the bread making process and human health. The aim of this study was to evaluate those effects by the Mixolab rheological properties, using a process mixture design. A process mixture design evaluates mixture variables, such as wheat flour and soursop residue flour, and process variables, in this case guar gum and a hemicellulose enzyme [Veron CP], to obtain the individual and blending effects. Using an I-optimal criterion, 21 runs were necessary to perform the experiment. Sixteen resulting Mixolab parameters were analyzed individually and only ten of them were chosen in order to be optimized. The desirability function was applied to select three new bread formulations: one to maximize the soursop residues flour utilization, the second with a strong network formation in gluten and the last one with a weak gluten network. These three formulations were compared with control bread, made only with wheat flour. A Repeated Measures Design was performed for the sensory evaluation, were 112 participants determine consumer preferences regarding the new formulations. The evaluation was made through a nine-points hedonic scale. Finally, proximate analysis was conducted to determine quality parameters and to compare the three new bread formulations and the control bread, this study was based on six categories: moisture, ash, crude protein, crude lipids, crude fiber and carbohydrates.

Keywords: Mixolab, process mixture design, soursop residues flour, bread, sensory evaluation

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