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Combined Effect of Gluten-Free Superfoods and by-Products from Ecuador to Evaluate the Functional and Sensory Properties of Breadmaking

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Abstract : In general, 'gluten-free' foods like breadmaking products provide functional or nutraceutical benefits for the consumer's health and increased their demand on the market. In Ecuador, there is an overproduction of superfoods, and the food by-products are undervalued. For the first time, to the author's best knowledge, gluten-free bread mixtures from quinoa and banana flour, cassava starch, lupine flour (LF), or whey protein (WP) with hydroxypropylmethylcellulose (HPMC) and transglutaminase (TG) were evaluated on their functional and sensory properties. Free amino groups and thiols, rheology, and electrophoresis SDS PAGE were performed to analyze the crosslinking of TG at different concentrations with HC or PL proteins. Dough characterization, pasting properties were evaluated, respectively, by a MIXOLAB and a rheometer with a pasting cell. The texture, porosity, and loaf volume were characterized using a texturometer, ImageJ software, and breadmaking ability, respectively. Finally, a breadmaking aptitude and sensorial bread acceptability were performed. A significant decrease in the content of free amino groups (0.16 to 0.11 and 0.46 to 0.36 mM/mg of protein) and free thiol groups (0.37 to 0.21 and 1.79 to 1.32 mM/mg protein) was observed when 1.0% and 0.5% TG were added to LF and WP, respectively. In apparent viscosity analysis, the action of TG on HC proteins changes their viscosity, while the viscosity of LF is not modified by TG. Results of electrophoresis in PL showed bands of higher molecular weight of different fragments of proteins with 1% TG. Formulation with 59.8, 39.9, 160.8, 6.0, 1.0, and 1.5% of, respectively, QF, BF, CS, LF or WP, TG, and HPMC had the best properties in dough parameters, pasting parameters (lower pasting temperature and higher peak viscosity), best crumb structure, lower crumb hardness and higher loaf volume (2.24 and 2.28 mL/g). All the loaves of bread were acceptable in baking aptitude and general acceptability.

Keywords : breadmaking, gluten-free, superfoods, by-products, Ecuador
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