APPLICATION OF A MIXTURE EXPERIMENTAL DESIGN IN THE DEVELOPMENT OF QUINOA (Chenopodium quinoa Willd.) COOKIES FORMULATION

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The quinoa (Chenopodium quinoa Willd) is a pseudocereal with high biological value proteins and considerable amounts of poly-unsaturated fatty acids, fibers, minerals and antioxidants. The use of quinoa flour in bakery products can be an interesting alternative, even for people with celiac disease. In the present study, 14 cookie formulations were produced applying mixture experimental design to substitute the wheat flour by a ternary mixture of quinoa flour (QF), quinoa flakes (QFL) and corn starch (ST). Cookies were analyzed for texture (hardness and brittleness), color (L*, a*, b*) and specific volume. The three ingredients affect the parameters analyzed, and the full cubic model fitted the texture, color and specific volume data well ($R^2 > 0.94$). According to the fitted models, the increased QF and QFL concentrations increase hardness, probably due to the higher fiber content of cookies, and reduce their luminosity value (L*), due to the occurrence of the Maillard reaction during baking. Higher ST concentrations increase the specific volume of cookies because the starch increases the product expansion capacity in relation to QF and QFL. The model based on the mixture experimental design is an important tool for selecting formulations that was only instrumentally evaluated and with potential for subsequent sensory analysis, and consequently saving time and reducing costs.