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Optimization of a low fat and high resistant starch biscuit formulation

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The detrimental effects of food over-consumption are raising a growing concern worldwide, implying high sanitary and social costs. Dietary-correlated diseases are considered among the leading risk factors of mortality. In this context, the production of foods able to satisfy dietary restrictions while maintaining acceptable structural and sensory characteristics is still a great challenge for industries. In particular, the relationships amongst food processing, texture and nutritional characteristics are seldom considered.

This work represents the first phase of a wider project aiming to investigate how different production technologies can be used in order to obtain low fat (LF) and low glycaemic index (LGI) biscuits with quality features comparable to those of the traditional counterparts and a better nutritional functionality. In particular, a Central Composite Design of Experiment (CCD) has been developed in order to optimize the LF-LGI biscuit formulation. The reduction (0-50%) of vegetable shortening and the substitution rate (0-80%) of wheat flour with a high amylose maize starch (source of resistant starch) have been considered as CCD factors. Thus, a total of 13 production trials have been planned, including four replicates of the central point.

Rheological properties and density of the biscuit doughs were analysed. Biscuits were characterized in terms of proximate composition, resistant starch content, geometrical features, colour, milk absorption, and texture (by means of a three-point bending test). Response surface methodology and desirability function will be applied to the analytical data, in order to study the main effects and their interaction and to optimize the biscuit formulation.

Results of this part of the wider project will increase the knowledge about the effects of fat reduction and resistant starch addition on biscuit quality characteristics. They will represent a reliable starting point for the subsequent study of the impact of production technology on structure and nutritional features of the product.

Keywords: biscuits, low-fat, design of experiment, low glycaemic index