

Optimization of gluten-free flat bread formulated with dry fractionated pea protein concentrate, corn and rice flours

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Bread is a staple food, and flat breads are the oldest. The flat breads include a multitude of nuances, diversified by thickness, ingredients, process, and cooking methods. The flat bread market is increasing, with optimal provisions for the next years, also considering the gluten-free versions. Generally, gluten-free breads are characterized by a poorer nutritional composition and the use of additives to improve their acceptability. The use of legumes, nutritionally complementary to cereals, could contribute to their nutritional improvement.

The aim of this work was to develop a new gluten-free flat bread, "focaccia-style" (a traditional Italian flat bread, approximately 2.5 cm thick) formulated with rice and corn flour, fortified with a pea protein concentrate having 55 g/100 g protein content. The latter was obtained by a dry fractionation process, a sustainable technique to obtain vegetable proteins based on a physical separation, without wasting water or using chemicals.

Bread formulation was defined by simplex-lattice mixture design, which helped to study how the flours influenced the behaviours of dough and breads. Ten formulations were selected and their physical and sensory characterization was carried out, considering both dough and breads, to identify the best one. The optimal formulation was then characterized also from the nutritional point of view.

The properties of dough and bread varied among the ten trials, being significantly affected by the ratio of the ingredients. Flat bread added of 5% pea protein was identified as optimal. Its characteristics were: crumb hardness = 9.1 N, chewiness = 4.8 N, orangish color ($a^* = 6.0$, $b^* = 31.8$), moderate legume odor (5.6 c.u. in a 0-9 scale) and legume flavor (5.3 c.u.). The same bread could be labelled as a "source of protein" (>12% of the energy value provided by proteins), "source of fiber" (>3 g/100g of fiber), and "low-fat" (<3 g/ 100 g) food product, according to the EC Regulation No. 1924/06.

Considering the increasing interest in vegetable alternatives and the need to formulate nutritionally balanced and sensorially acceptable gluten-free flat breads, the use of pea protein concentrate, even at a reduced amount, demonstrated to be an effective and sustainable strategy.