

Nutritional Optimization, Starch and Protein Digestibility of Pasta Made with Gluten Free African Cereal and Legume Flours

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Abstract

Nutritional optimization of staple foods can participate to a global strategy to fight malnutritions. Pasta is one of the most popular staple foods. Traditionally made from wheat, its formulation has been improved these last years by including legumes beside wheat in its formulation. The next effort for improving its formulation would be to use climate-smart crops. The objective of our study is to develop nutritionally optimized pasta made from gluten free African raw materials adapted to climate transition. This is part of the H2020 Innofood Africa project federating European and African countries on the development of climate-smart crops and their use in the context of a balanced diet.

Nutritional and antinutritional composition of African legume, cereals and other nutritious raw material flours were determined (protein, amino acids content, starch, sugar, fibers, vitamins, minerals, phytic acids and trypsin inhibitor) and assembly in a data base for nutritional optimization of pasta by a nonlinear mathematical programming. In order to cover 1/3 of adult daily needs (considering 3 meals a day), one serving of pasta (100g) should complete these following criteria: an amino acid chemical score above 100, an omega 6/omega 3 ratio lower to 5, a fiber quantity between 8 and 25g, quantities of iron, zinc, B9 vitamin and beta carotene at less equal to 9.8mg, 1.6mg, 130µg and 1mg respectively, and minimization of anti-nutritional factors. From these criteria four pasta formulations were selected: [100% cowpea], [90% cowpea /10% amaranth leaf], [60% cowpea/40% teff] and [55% cowpea/ 35% teff/ 10% amaranth leaf]. They were processed by a classical low temperature extrusion process followed by a low temperature drying preserving their nutritional qualities. Pasta have been characterized and compared with classical and whole 100% durum wheat semolina (DWS) pasta for their textural, culinary and nutritional properties. All cowpea based pasta have lower optimal cooking time and higher cooking losses than DWS pasta. The addition of teff and/or amaranth leaves to cowpea decreases pasta firmness. All cowpea based pasta have lower rapidly digestible starch and higher PDCAAS compare to DWS pasta, which make them interesting from a nutritional point of view.

PRESENTER BIOGRAPHY: PAULINE PINEL

Pauline Pinel is a second year PhD student at the Institut Agro Montpellier in France, under the supervision of Valérie Micard and Claire Bourlieu-Lacanal. She works on innovative food matrix based on cereals, legumes and leafy vegetables and how find the optimal formulation to improve nutritional balance. The thesis project is part of the Innofood Africa H2020 project which brings together African and European partners. The objective of this project is the development of the production, process and use of climate-smart African crops.