

EXTRUSION-COOKING OF MAIZE FLOURS WITH DIFFERENT AMYLOSE:AMYLOPECTIN RATIO FOR THE PRODUCTION OF GLUTEN-FREE SNACKS

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Maize is a suitable ingredient in gluten-free formulations and thanks to its chemical composition is widely used in snack production. The aim of this study was to investigate the bioactive compounds and the technological properties of three maize flours different in amylose:amylopectin ratio and used to produce snacks by extrusion-cooking. Flours (particle size <250 µm) were obtained from: i) a conventional hybrid (P1547, amylose = 18%; CVM), ii) high-amylose maize hybrid (Amylor, amylose = 42%; HAM) and iii) waxy maize hybrid (Pioneer 1547E, amylose = 2%; WAM). Extrusion-cooking was performed using a co-rotating twin-screw extruder (screw speed: 100 rpm; temperature: 117 °C; pressure: 70 bar).

HAM showed the highest content of resistant starch (RS; 18%), while RS in CVM and WAM was <1%. The HAM showed also the highest antioxidant capacity (AC, 6.12 mmol Trolox eq/kg) and the highest content of cell wall-bound phenolic acids (CWBPAs; 629 mg/kg).

Despite the high RS content in HAM, after processing RS significantly decreased. Indeed, starch susceptibility to α -amylase hydrolysis significantly increased due to extrusion-cooking, as result of starch gelatinization. However, sample from HAM showed the lowest starch susceptibility to α -amylase. Neither the samples showed gelatinization and retrogradation properties suggesting that starch structure was destroyed after the extrusion-cooking.

The concentration of CWBPAs did not significantly change after extrusion-cooking, while the content of soluble phenolic acids (SPAs) significantly decreased and the AC increased in all samples. Snacks from HAM had the highest content of CWBPAs (620 mg/kg dw), SPAs (66.9 mg/kg dw) and antioxidant activity (11.4 mmol Trolox eq/kg dw). These samples showed the highest density (1.38 g/cm³) and the lowest section area (233 mm²). Indeed, HAM snacks had the highest porosity rate (67%) resulting in a high number of small pores per mm². All these characteristics are related to the packed starch structure in HAM, also accounting for the highest breaking force (31 N). In conclusion, amylose content significantly affected flour behavior during extrusion-cooking, with HAM showing the highest antioxidant compounds and the best technological performance, suggesting its use in the production of filled snacks.

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Keywords

Extrusion-cooking, Gluten-free snacks, Maize flour, Resistant starch, Antioxidant compounds