

Abstract

Selecting Type of Grain and Bigger Particle Size to Modulate Starch Digestibility and Glycemic Response [†]

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Abstract: Context and Objectives: Cereals and pseudo-cereals show a variety in terms of shape and color but also nutrition composition and starch structure. Altering particle size and grain integrity may influence the availability of nutrients and their metabolic impact. We studied the impact of different grains with bigger particle sizes than flours on starch digestibility and glycemic and insulinemic indexes in humans. Methods: Moist biscuits, containing 40% of intact grains of quinoa, millet, teff, fonio, or buckwheat grits, and a control made with wheat flour, were produced. Starch digestibility of the final products was analysed according to the Englyst method after two preparation methods: mincing, which led to conditions close to mastication or milling, which led to sample pulverization. Glycemic and insulinemic indexes (GI; II) and response parameters following consumption of these products were evaluated in humans. Product portions provided 50 g of available carbohydrates. The study was performed on 19 healthy normal-weight subjects who tested all six moist biscuits according to a cross-over design. Results: Starch digestibility analyses in minced products showed low Slowly Digestible Starch (SDS) content in control, high SDS content in buckwheat biscuits, high SDS and resistant starch (RS) contents in quinoa and fonio, and high RS in teff and millet products. When analysing milled samples, SDS and RS decreased in buckwheat and quinoa biscuits. RS decreased and SDS increased in teff and millet, and the values remained similar to minced samples for fonio biscuits. GI values for the products were 60 ± 7 for quinoa, 55 ± 7 for millet, 52 ± 7 for control and buckwheat, 41 ± 9 for teff, and 39 ± 5 for fonio biscuits. Teff and fonio biscuits led to lower glycemic responses compared to the other products. Insulin responses were related to the glycemic responses. Conclusions: The type of grains and the use of intact grains strongly impact starch digestibility, allowing for the modulation of glycemic and insulinemic responses. Using different types of grains to wheat and different particle sizes would allow for the modulation of glucose metabolism and potentially lead to long-term beneficial health effects.

Keywords: grains; particle size; starch digestibility; glycemic response



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