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Exploring the nutritional and technological potential of sorghum in wheat-based breads

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Abstract

Climate change challenges have heightened the need for alternative crop cultivation methods. Sorghum, known for its resilience in adverse conditions, emerges as a promising grain that thrives in both traditional (India, African countries) and Western regions. Sorghum's kafirins, the prolamin fraction, though, can crosslink with polyphenols and starch, potentially reducing its digestibility. This study aimed to assess the potential of sorghum in the Western diet by investigating its nutritional attributes and technological properties. Eight sorghum varieties cultivated in Austria, namely Arabesk, Armorik, Arsky, Ggolden, Huggo, Icebergg, Kalatur, and PR88Y92, were analysed for total phenolic content (TPC), antioxidative activity, and *in vitro* starch and protein digestibility. Three varieties (Huggo, Icebergg, Kalatur) were selected for baking trials to evaluate their baking properties and the impact of TPC. These varieties differed in their pericarp colour (red, white, white) and TPC (high, medium, low, respectively). Substituting 40 % of wheat flour with sorghum flour in a standard western-style bread recipe, the resulting breads were examined for physical characteristics, such as baking loss, crust and crumb colour, crumb firmness and relative elasticity, pore properties of the crumb, and specific volume. Additionally, the TPC, antioxidative activity, and *in vitro* starch and protein digestibility were analyzed. The substitution of wheat flour with 40 % sorghum flour resulted in a decrease in specific volume and relative elasticity, but a significant increase in TPC and antioxidative potential, regardless of the variety. A significant disparity in total phenolic content (TPC) and antioxidative activities was noted among the sorghum varieties, contrasting with the consistent findings for *in vitro* starch and protein digestibility. The relationship between total phenolic content (TPC) and *in vitro* protein digestibility was clearly inverse in both breads and flours, while no such association was found between TPC and *in vitro* starch digestibility. This research demonstrates the potential of enhancing TPC in wheat bread by incorporating sorghum, albeit with a trade-off of reduced *in vitro* protein digestibility. The study enhances our understanding of how different sorghum varieties influence the quality of sorghum-wheat breads, providing valuable insights for the development of nutritious and functional wheat-based products.

Keywords: Digestibility, protein, sorghum, TPC, western-style bread

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