SIAN
Simpósio de Alimentos e Nutrição

Protein digestibility and phenolic compounds composition of sorghum grains grown in northern Europe are impacted by grain processing

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Sorghum is a promising protein-source cereal, rich in phenolic compounds (PC) presenting agricultural advantages, as heat and drought tolerance. This work aims to evaluate the impact of sorghum grain dehulling and cooking on protein solubility, *in vitro* digestibility, and phenolic composition profile. The study was performed on four sorghum varieties HD7, HD19, HD100 and HD101 of which two are black varieties (HD100 and HD101). Grain average weight, moisture, and ash content were determined by gravimetric methods. Changes in grain color were measured by CIE L*, a*, and b* scale. Sorghum grains were dehulled into a laboratory-scale abrasive grain polisher, to obtain three final products: whole-grains (WG), 15% dehulled grain (DG) and bran (B). Products were cooked in excess of water, freeze-dried and crushed to obtain fine pounder. Protein content and amino acids composition were determined by micro-Kjeldahl and HPLC methods, respectively. PC were sequentially extracted and analyzed by high-resolution untargeted metabolomics (UPLC-ESI-QTOF/MS). Grain weight ranged between 18.13±0.29 and 30.69±0.58 mg, with 13% of moisture content in average for all varieties. 95% of grains measured between 2.0-2.4 µm. HD7 and HD19 varieties are lighter-yellowish grains, while HD100 and HD101 are darker-bluish. Protein content ranged from 9 to 14%, and although essential/conditionally essential amino acids were found, lysine was below recommended chemical scores for adult nutrition. *In vitro* protein digestibility was decreased after grain cooking that was in part counteracted by grain dehulling. Finally, 262 PC were annotated by metabolomics tools, showing flavonoids as the most representative class (91%). Multivariate analyzes showed a higher dehulling and genotype impact on the phenolic profile compared to cooking process. However, this thermal treatment was essential for proanthocyanidins

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dimers/trimers depolymerization, indicating a possible increase in protein/starch gastrointestinal digestibility. These results can stimulate sorghum consumption and dehulling/cooking as a viable option for the development of sorghum-based products.

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