Proceedings of the Nutrition Society (2021), **80 (OCE1)**, E39 doi:10.1017/S0029665121000409

Winter Conference Live 2020, 8–9 December 2020, Micronutrient malnutrition across the life course, sarcopenia and frailty

The impact of cooking and digestion on the phenolic acid content of selected Nigerian and UK grown wholegrains

O. A. Obayiuwana[1,2], V. Behrends[1], Y. Calle-Patino[1], A. Costabile[1] and G. Corona[1]
[1]*Department of Life Sciences, University of Roehampton, United Kingdom and*
[2]*Department of Medical Biochemistry, University of Benin, Nigeria*

Wholegrains are a good source of phenolic acids (PAs), which can significantly contribute to their beneficial health properties. Thus, their bioactivity will depend on their bioaccessibility and bioavailability, which in turn can be significantly affected by cooking and digestion processes.

This study aims to determine the PAs profile of Nigerian and UK grown cereal grains (red and white fonio, red and white millet, red and white sorghum, red and white quinoa, emmer, spelt rye, ofada rice, white corn and hulless barley). A selection of four PAs rich grains was further studied to assess the impact of cooking and *in vitro* digestion on the PAs levels.

Grains were finely milled, and the extraction of soluble and bound phenolic acid was conducted as described by Li et al. (2008)(1) and 25 PAs were quantified using UHPLC/ MS-MS(2). Grains were cooked by boiling and subsequently oral, gastric and small intestinal phases of digestion were simulated *in vitro* under pH and temperature-controlled environments(3). Statistical analysis was conducted by 2-way ANOVA, followed by Tukey's multiple comparisons test ($P < 0.05$) using GraphPad Prism version 8 Software.

PAs in grains were predominantly in bound form (73.15%-99.95%) and total PAs levels ranged from 132.2 ± 12.1ng/mg to 2202.5 ± 34.9 ng/mg. White corn had the highest PAs content with 99.9% of this in the bound form, while white fonio had the lowest total PAs content. Red millet, white millet and red sorghum had comparable levels of total PAs: 1631.2 ± 227.5ng/mg, 1466.1 ± 187.1ng/mg and 1464.2 ± 184.2ng/mg, respectively and they also had the relative highest amount of soluble PAs. The total amounts of hydroxycinnamic acids exceeded that of hydroxybenzoic acids with ferulic acid been the most abundant in all the grains studied. Homovanillic acid was the most abundant hydroxybenzoic acid in most grains except in quinoa and red fonio. Cooking was seen to significantly increase bound PAs content compared to raw (373.1 ± 8.0ng/mg to 3342.6 ± 920.1ng/mg; $P < 0.05$) in all grains except in red fonio, whereas it led to a significant decrease in soluble PAs for all grains (1.8 ± 0.8ng/mg to 18.5 ± 7.1ng/mg; $P < 0.05$). *In vitro* digestion led to a significant increase of bound PAs in red millet compared to raw (1414.0 ± 229.9ng/mg to 2527.8 ± 247.6ng/mg; $P < 0.05$), whereas it led to a significant decrease in soluble PAs in all grains (0.1 ± 0.03 to 2.4 ± 3.2; $P < 0.05$)

Overall, our results highlight that cooking and simulated gastrointestinal digestion can significantly affect the levels of PAs in the wholegrains studied, having an opposite impact in the levels of bound and soluble forms. The increased amount of extractable bound phenolic acids due to cooking and *in vitro* gastrointestinal digestion may have a potential impact of gut health. Studies are ongoing to determine the role of the gut microbiota on the bound PAs and vice-versa.

Acknowledgments

The first author is grateful to the Schlumberger Foundation for the Faculty for The Future fellowship and to the University of Roehampton for funding this study.

References

1. Li L, Shewry, PR, & Ward JL (2008) *J Agric Food Chem*, **56**(21), 9732–9739.
2. Schär MY, Corona G, Soycan G, *et al.* (2018) *Mol Nutr Food Res* **62**, 1700499 (1–9).
3. Corona G, Ji Y, Anegboonlap P, *et al.* (2016) *Br J Nutr* **115**(7), 1240–53.