



Deposited via The University of Leeds.

White Rose Research Online URL for this paper:

<https://eprints.whiterose.ac.uk/id/eprint/110991/>

Version: Published Version

---

**Proceedings Paper:**

Perez Hernandez, L, Morgan, M, Bosch, C et al. (2016) Polyphenol release in Borlotti beans (*Phaseolus vulgaris*) during cooking, soaking, simulated digestion and acid hydrolysis. In: Proceedings of the Nutrition Society. Phytochemicals and health: new perspectives on plant based nutrition, 21-22 Mar 2016, Edinburgh. Cambridge University Press. Article no: E53. ISSN: 0029-6651. EISSN: 1475-2719.

<https://doi.org/10.1017/S0029665116000434>

---

(c) 2016, the Authors. This version is free to view and download for private research and study only. Not for re-distribution, re-sale or use in derivative works. Published in the Proceedings of the Nutrition Society and available at <https://doi.org/10.1017/S0029665116000434>

**Reuse**

Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

**Takedown**

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing [eprints@whiterose.ac.uk](mailto:eprints@whiterose.ac.uk) including the URL of the record and the reason for the withdrawal request.

## Polyphenol release in Borlotti beans (*Phaseolus vulgaris*) during cooking, soaking, simulated digestion and acid hydrolysis

L. Perez-Hernandez, M. Morgan, C. Bosch and C. Orfila  
*School of Food Science and Nutrition, University of Leeds, Leeds, LS2 9JT, UK*

Polyphenols present in beans have been associated with the putative health benefits of this legume<sup>(1)</sup>. However, the bean matrix may have an impact on the bioaccessibility and bioavailability of polyphenols<sup>(2)</sup>. There is limited knowledge on the release of polyphenols from the matrix during starch and protein digestion. The aim of this study was to quantify and characterise the polyphenols released during domestic food preparation and simulated intestinal digestion of Borlotti beans. The polyphenols remaining in the fibre residue fraction were also quantified. The polyphenols released during domestic food preparation and simulated intestinal digestion of Borlotti beans. The polyphenols remaining in the fibre residue fraction were also quantified.

Beans (25 g) were soaked overnight in water (100 mL) and drained. The soaked beans were then boiled in water (100 mL) for 1 h and then drained again. Cooked beans were homogenised and digested using an optimized simulated digestion method using porcine pancreatic  $\alpha$ -amylase (250 U), amyloglucosidase (80 U), and protease (30 U) in sodium maleate (50 mM) with  $\text{CaCl}_2$  (2 mM) buffer. The remaining undigested residue was hydrolyzed using 1M HCl for 1 h. Total polyphenols (TPP) released during each stage were determined using the Folin Ciocalteu assay and expressed as gallic acid equivalents (GAE). Results are shown in Table 1.

Enzymatic digestion resulted in the highest amount of extractable polyphenols compared to cooking, soaking and fibre residue. It was also observed that a higher amount of polyphenols were released after starch digestion than after protein digestion. But the highest release was observed during simultaneous digestion of starch and protein.

**Table 1.** Total polyphenol content (TPP) of fractions released during soaking, cooking, enzymatic digestion and acid hydrolysis.

Process/fraction	TPP released (mg GAE/ g cooked sample)	
	Mean	SD
Soaking	1.95	0.13
Cooking	2.22	0.09
Protein digestion	6.54	0.46
Starch digestion	30.78	0.75
Protein and starch digestion	40.42	2.49
1N HCl digestion of undigested residue	4.15	0.45

Values are means for three independent experiments. Mean values were significantly different between samples (ANOVA, followed by Tukey test): \* $P < 0.05$ .

Results indicate that most of the polyphenols in Borlotti beans are retained during soaking and cooking and released upon digestion of the starch and protein matrix. The polyphenol content in the undigested residue would be available for fermentation by the microbiota. Further experiments are required to identify the polyphenols present in each fraction and evaluate the possible health benefits exerted by the polyphenols present in both digestion and fibre residue fractions.

1. Oomah BD, Tiger N, Olson M *et al.* (2006) *Plant Foods Hum Nutr* **61**, 86–92.
2. Jakobek L (2015) *Food Chem* **175**, 556–67.