

Potential of walnut (*Juglans regia* L.) oil by-products as functional food ingredients: Antioxidant and prebiotic properties post the simulated gastrointestinal tract digestion

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The oilcake and oil decantation dregs are primary by-products of the walnut oil industry, currently being repurposed as fertilizers or animal feed¹. This study explores their potential application as food ingredients by assessing their bioactivity, specifically antioxidant and prebiotic properties, both pre- and post-simulated gastrointestinal tract (GIT) digestion according to the INFOGEST protocol.

Antioxidant activity was evaluated using two *in vitro* assays: inhibition of lipid peroxidation measured by thiobarbituric acid reactive substances (TBARS) and 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging. The prebiotic potential of the samples at a 2% concentration was tested with five probiotic strains.

When comparing the EC₅₀ values of the bioaccessible fractions (BF) obtained post-GIT, both the digested oilcake and dregs exhibited enhanced antioxidant activity (an increase of 86% and 84% for the oilcake and 38% and 55% for dregs, in TBARS and DPPH, respectively) compared to the corresponding initial samples. Furthermore, the by-products BF stimulated probiotics growth, surpassing the positive control (fructooligosaccharides) and the samples not subjected to GIT, which underscores the potential of these by-products for gut health. Overall, the bioactivity of the studied by-products was even improved by digestion, which highlights their suitability as functional foods.

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- (1) Jahanban-Esfahlan, A.; Ostadrahimi, A.; Tabibiazar, M.; Amarowicz, R. A Comparative Review on the Extraction, Antioxidant Content and Antioxidant Potential of Different Parts of Walnut (*Juglans Regia* L.) Fruit and Tree. *Molecules* **2019**, 24 (11), 2133. <https://doi.org/10.3390/molecules24112133>.