

Biorefining of buckwheat flowers and European goldenrod leaves by supercritical carbon dioxide and pressurized liquid extraction

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The aim of this study was to evaluate the effectiveness of recovery of phytochemicals from buckwheat flowers (BF, *Fagopyrum esculentum*) and European goldenrod leaves (GL, *Solidago virgaulea*) using supercritical carbon dioxide extraction (SC-CO₂) with pure CO₂ and co-solvent ethanol and consecutive pressurized liquid extraction (PLE) with increasing polarity solvents: hexane, acetone, ethanol:water (80:20) and water.

The yields of BF and GL extracts obtained by SC-CO₂ were 1.8 and 2.4 g/100g dw, respectively, whereas adding 10% of high polarity ethanol increased extract yields approx. 2 times, e.g. to 2.6 (BF) and 5.5 g/100g dm (GL). In case of PLE the yields of BF and GL were remarkably higher, from 3.15 (BF, hexane) to 44.8 (BF, water) and from 5.9 (GL, hexane) to 38.2 g/100g dm (GL, water) indicating that solvent polarity played the most important role. Antioxidant capacity of BF and GL was evaluated by Oxygen Radical Absorbance Capacity (ORAC) assay applying it to the extracts and directly to the solids, including initial ground powders and the residues remaining after extractions (QUENCER method). Antioxidant capacity of extracts obtained from BF and GL by SC-CO₂ were rather low; however adding co-solvent ethanol or applying PLE increased antioxidant capacity values of extracts approx. 2.5 times. Antioxidant capacity of PLE residues measured by QUENCER method was approximately 2 times lower comparing with that of the whole initial material before extraction.

The extracts were further analyzed by liquid chromatography and mass spectrometry for identifying and quantifying the main recovered by extraction phytochemicals. In general, the results showed that BF and GL contain various polyphenolic compounds, which were previously reported as demonstrating various health benefits. Therefore, these plants may be considered as promising sources of functional nutraceutical ingredients, whereas high pressure extraction methods might be preferable techniques for the recovery of phytochemicals from these botanicals.

Preferred presentation: poster

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