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Microwave hydrodiffusion and gravity: An emergent technology for green extraction of non-volatile compounds

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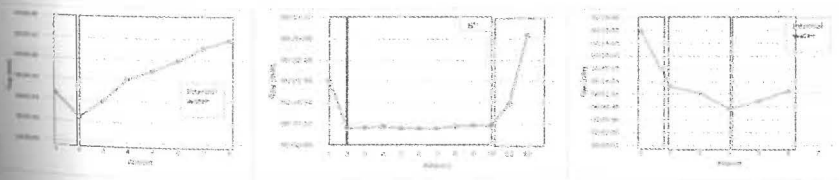
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Microwave technologies are more and more present in food applications due to their performance in shortening the time of treatments such as drying, pasteurization, defrosting, or postharvesting. While solvent-free microwave extraction has been extensively used as a green procedure for essential oil and volatile compounds from aromatic herbs [1], its applications have been extended to enhance extraction of phytochemicals simultaneously with drying.

In this work, microwave hydrodiffusion and gravity was performed in a laboratory microwave oven (NEOS-GR, Milestone, Italy), in order to evaluate its efficiency in the extraction of nonvolatile compounds such as: free sugars, fibers, colour, and phenolic compounds. Five different matrices were tested: broccoli by-products (90% moisture), apple pomace (80% moisture), spent coffee grounds (65% moisture), *Pterospartum tridentatum* inflorescences, and brown algae, the latter two in dried state. The flow behaviour was very dependent on matrix (Figure 1): for broccoli, the time to obtain 50 mL aliquots increased along time while for apple pomace it was always the same after the initial and final heating periods, and for the spent coffee grounds it was always decreasing. Good recoveries were observed when using high water content matrices, such as apple pomace and broccoli. However, when using hydrated matrices, such as brown algae and *Pterospartum tridentatum* inflorescences, it was observed that the amount of material extracted is very low. In the case of spent coffee grounds (a material where water is added to the ground coffee when preparing espresso coffee), the initial low recoveries can be overcome by the co-addition of ethanol, allowing to obtain fractions rich in phenolic compounds, as well as brown compounds (with antioxidant activity) and caffeine.

NEOS-GR, using microwave hydrodiffusion and gravity is a green extraction technology to obtain hydrophilic compounds from wet matrices using its own water, allowing the extraction of valuable non-volatile compounds.



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[1] A. Filly, X. Fernandez, M. Minuti, F. Visinoni, G. Cravotto, F. Chemat, Food Chemistry, 150, 2014, 193-198.