Green extraction of phenolic compounds from food by-products and their biological activity

Manuela Panic, Kristina Radosevic, Veronika Gunjevic, Marina Cvjetko Bubalo, Klara Kraljic, Marko Obranovic, Dubravka Skevin and Ivana Radojcic Redovnikovic
University of Zagreb, Croatia

Food processing generates a substantial volume of solid organic by-products. Although they represent a rich source of bioactive compounds, only small amounts of these by-products are upgraded or recycled and are usually used for composting or even discarded in open areas potentially causing environmental problems. In the food industry, wine and oil by-products are the most abundant worldwide. Furthermore, grape and olive pomace have also been evaluated as a source of antioxidants due to a high content of phenolics. Another interesting by-product from oil production is flaxseed press cake, as a significant source of phenolic compounds lignans, obtained as a by-product of flaxseed oil production. Extraction techniques for such by-products for their evaluation and utilization should be based on green and sustainable technologies, by following the principles of green extraction. This can be achieved by: (i) improvements to and optimization of existing processes; (ii) use of non-dedicated equipment; and (iii) innovations in the processes and procedures used, including the discovery of alternative solvents. Herein, to establish environmentally friendly extraction methods for the phenolics contained in the above-mentioned food by-products, natural deep eutectic solvents were investigated as a green alternative to conventional solvents, coupled with alternative energy sources – ultrasound and microwave irradiation either used independently or simultaneously. Furthermore, biological activities of prepared extracts were valorized by determination of the antioxidant capacity by ORAC (oxygen radical absorbance capacity) and in vitro cytotoxicity on three cell lines (MCF-7, HEK293T and HeLa).

Biography
Manuela Panic graduated from the Faculty of Food Technology and Biotechnology, University of Zagreb, Croatia, where she obtained title Master of Bioprocess Engineering, in 2016. In 2017, she enrolled for PhD in Biotechnology and Bioprocess Engineering, at the same Faculty. Currently, she is a Research Assistant in the Laboratory for Cell Technology, Application and Biotransformations at the Faculty of Food Technology, University of Zagreb. Her research activities are related to extraction of phenolic compounds from food industry by-products, biocatalysts with enzymes and microbes and in vitro cytotoxicity in animal cell cultures. She had participated in the Croatian Science Foundation project “Green solvents for green technologies” in which she prepared natural ILs and DESs, extracted, identified and quantified phenolic compounds from grape pomace, estimated behavior of Candida antarctica lipase B and Saccharomyces cerevisiae in natural DESs and evaluated biological activities of grape pomace extracts in human tumor cell lines.

mpanic@pbf.hr