GREEN PROCESSES TO EXTRACT BIOACTIVES FROM NATURAL SOURCES

Elena Ibáñez

Instituto de Investigación en Ciencias de la Alimentación CIAL (CSIC-UAM)
C/Nicolás Cabrera 9, Campus de Cantoblanco, 28049 Madrid, SPAIN

At present, there is an enormous interest in finding new bioactive compounds able to prevent or improve the health status of the individuals, mainly acting as food supplements or functional food ingredients. Compounds such as antioxidants have been associated to lower risk of certain diseases that are nowadays widespread in the developed countries, such as coronary heart diseases and cancer [1,2]. Undoubtedly, nature can be considered a unlimited source of bioactives and the search of new compounds with improved activities have ran parallel to the search for new natural sources. In it well known that there are many families of compounds with proved antioxidant activity, such as phenolic compounds, carotenoids and tocopherols, which are easily available in the vegetal kingdom. But at present there is a huge interest in the potential use of marine natural sources to obtain these bioactives, mainly considering their huge diversity, in terms of number of different species that might be potentially used, their sometimes unique chemical structures and their ability to work as natural bioreactors potentiating the synthesis of valuable compounds depending on the cultivation conditions.

Moreover, researchers are facing new challenges in the development of new extraction processes to obtain bioactives from natural sources. Up to now, traditional extraction methods (mainly S-L extraction) have been used to extract bioactives; these methods have several drawbacks like they are time consuming, laborious, have low selectivity and/or low extraction yields. New challenges involve the development of fast, selective, efficient, sustainable, green (without using toxic organic solvents), with high yields and at lower cost. The techniques able to meet these requirements are, among others, those based on the use of compressed fluids such as supercritical fluid extraction (SFE), pressurized liquid extraction (PLE) and subcritical water extraction (SWE), which are among the more promising processes [3, 4]. Depending on the polarity of the green compressed fluid, different "green" or environmentally clean technologies can be used, as can be seen in Figure 1.

In this presentation, different examples will be shown, considering different raw materials such as plants, algae and food by-products and employing the above mentioned green technologies. With this approach we will try to demonstrate the possibility of tuning the extraction conditions depending on the target compound(s) and the raw material.

The selected examples cover the extraction of antioxidants from plants such as *Melissa officinalis* by PLE, using ethanol and water as extracting solvents, compared to enzyme-assisted extraction; the extraction of carotenoids of *Neochloris oleoabundans* by PLE considering ethanol and limonene as green solvents; and the comparison on the performance of three different extraction procedures (PLE using water and ethanol as solvents, SFE using neat CO_2 and supercritical CO_2 modified with ethanol, and Water Extraction and Particle formation On-line (WEPO)) towards the extraction of antioxidants (mainly carnosic acid)

from rosemary (*Rosmarinus officinalis*). Moreover, a continuous process based on supercritical antisolvent fractionation of PLE extracts of rosemary and olive leaves is presented as a fast and selective way to tune the selectivity of the process towards the compounds of interest.

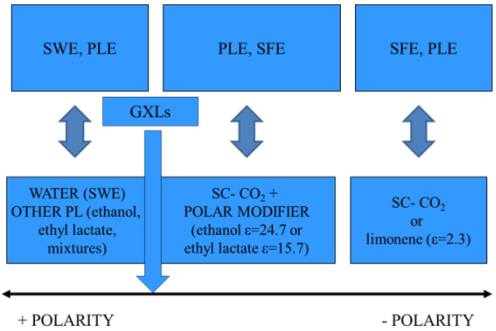

Figure 1. Green solvents and environmentally friendly technologies used to extract bioactives from natural sources

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*Corresponding author: elena@ifi.csic.es