

Title: Recovery of polyphenols from agri-food industry wastes: Assessment of Microwave Assisted Extraction and Pressurized Liquid Extraction

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Agricultural processing inevitably goes with the production of a large amount of agri-food industries residues. In recent years, there has been an increasing interest in high-value natural compounds that can be found in most of these residues. It is the case of phenolic compounds, which have attracted more and more attention due to their powerful antioxidant properties and their potential effects in the prevention of various diseases associated with oxidative stress, such as cancer.

The growing interest in the properties of polyphenols has motivated scientists to explore more efficient, more cost-effective and more eco-friendly extraction approaches. Modern extraction techniques, which are an alternative to conventional ones, include: Ultrasound-assisted extraction (UAE), Microwave-assisted extraction (MAE) and Pressurized liquid extraction (PLE).

This work is included in the framework of a project related to circular economy and the revalorization of waste from different agri-food industries. It focuses on finding the best conditions for the extraction of polyphenols with great interest in applications as nutraceuticals and as antioxidant supplements. In particular we have investigated the extraction of polyphenols from spinach and orange wastes by MAE and PLE, using a mixture based on the ethanol/water/hydrochloric acid system.

On the one hand, we have found that the optimum conditions for MAE are a solvent composition of EtOH/H₂O/HCl 60/39.9/0.1 (v/v/v), 90°C and 5 minutes for spinach matrix, and a solvent composition of EtOH/H₂O/HCl 60/39.9/0.1 (v/v/v), 120°C and 15 minutes for orange matrix.

On the other hand, the optimum conditions for PLE are a solvent composition of EtOH/H₂O/HCl 40/59.9/0.1 (v/v/v) and 80°C for spinach matrix for an extraction time of 5

minutes, and a solvent composition of EtOH/H₂O/HCl 60/39.9/0.1 (v/v/v) and 80°C for orange matrix for an extraction time of 5 minutes.

The comparison of the extraction of polyphenols from the target matrices by UAE, MAE and PLE points out that the most suitable technique for orange matrix is PLE, but for spinach matrix UAE can be a convenient approach.

Keywords: polyphenols, antioxidant, MAE, PLE, circular economy, agri-food wastes.