

## Recovery of polyphenols from agrofood by-products by using membrane systems

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Membrane systems, already widely consolidated in the agro-food sector thanks to their intrinsic properties compared to conventional separation technologies, also represent an innovative approach for the treatment of wastewater and by-products of the supply chain in a circular economy logic.

In this work, studies relating to the development of eco-sustainable processes for the recovery of natural antioxidants from olive mill wastewaters (OMWs) and from aqueous extracts of solid fennel residues through the use of membrane systems, also in integrated systems, are presented.

A combination of straw filtration and nanofiltration (NF) has been investigated for the first time as a sustainable approach for the recovery of phenolic compounds from OMWs. Ground straw filters with different granulometry (120, 250 and 500  $\mu\text{m}$ ) were tested in the first step to clarify the raw wastewater. Polymeric NF membranes, with molecular cutoff in the 150-500 Da range, were studied in dead-end filtration tests to obtain concentrated phenolic fractions from clarified waters. Their performances, in terms of productivity, degree of fouling and rejection towards the components of interest (e.g. total polyphenols, flavanols, hydroxycinnamic acids) were properly analysed.

The combination of microfiltration (MF) and NF processes has also been investigated to obtain concentrated polyphenolic fractions from an aqueous fennel extract. The study was particularly focused on the analysis of the performance of a flat NF polymeric membrane in the treatment of the clarified extract, in cross-flow mode, under different operating conditions of pressure and axial flow rate of the feed solution. The optimal operating conditions have been defined for obtaining phenolic fractions to be used as raw materials for the production of functional foods.

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