

Assessment of several organic and inorganic membranes to ultrafilter a phenolic extract from two-phase olive mill wastewater

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Abstract

The main wastewater produced by the olive oil industry in Spain is Two-phase olive mill wastewater (TPOMW). Its disposal represents a major concern due to its high organic load and phytotoxicity. However, it is also a source of phenolic compounds, whose recovery is very interesting due to their proven health benefits.

TPOMW has been subjected to an ultrasound-assisted solid-liquid extraction to retrieve biophenols and contribute to its detoxification. The ultrafiltration of this phenolic extract has been studied to find the proper membrane and operational conditions that allow their purification.

Two organic (UH050 and UP005, Microdyn Nadir) and one ceramic membrane (Inside Ceram 50, Tami Industries)

were studied. Organic membranes were soaked in ethanol/water 50:50 (v/v) during 24h as a conditioning treatment. Two cross-flow velocities (1.8 and 2.5 m·s⁻¹) and three transmembrane pressures (TMPs) (0.75, 1.5 and 2.5 bar) were examined. After each experiment, total phenolic content, total sugar content and color were measured. Previously, permeability of ethanol/water 50:50 (v/v) solutions was measured as a reference. Also, the cleaning of the Inside Ceram 50 membrane was optimized. To this end, water and P3 Ultrasil 115 1% (v/v), at different temperatures, were considered.

Abnormally high fluxes were obtained with UH050. Damage was revealed by SEM images, probably as a result of the contact with ethanol. Opposed results were obtained with UP005. At 2.5 m·s⁻¹, permeate flux was lower than 5 L/h m². Inside Ceram 50 displayed stable fluxes. It barely retained phenolic compounds and rejected some unwanted species, as sugars and pigments.

Keywords: Two-phase olive mill wastewater, phenolic compounds, recovery, ultrafiltration, detoxification.