

Obtaining Hydroxytyrosol from Olive Mill Waste Using Deep Eutectic Solvents and Then Supercritical CO₂

Plaza A.

Tapia X.

Yañez C.

Vilches F.

Candia O.

Cabezas R.

Romero J.

The main objective of this study was to recover hydroxytyrosol from olive mill waste (olive leaves and a semi-solid waste with a 65-75% of humidity called alperujo). The recovery process involved solid-liquid extractions using two hydrophilic deep eutectic solvents (DESs), CIS-DES (a 1:1 mixture of choline chloride and citric acid) and Etagline (a 1:2 mixture of choline chloride and ethylene glycol). The results achieved using this non-conventional process was compared with the results achieved using conventional solid-liquid extraction processes using ethanol, methanol, and water. The extraction ratio (R) achieved using Etagline DES was 11.4 times higher than the R achieved using methanol. The hydroxytyrosol extraction efficiencies were higher when using the selected DESs than using methanol, under the same working conditions. On the other hand, with the use of DES it is possible to obtain similar extraction efficiencies to those obtained with organic solvents, but using 75% less extraction phase, when DESs were used instead of methanol. The DES extraction processes gave high re-extraction capacities when supercritical CO₂ was used as a stripping phase. The highest pure hydroxytyrosol extraction efficiency, 80%, was achieved using Etagline and supercritical CO₂ re-extraction at a pressure and temperature close to the critical values. The results suggest that DES is an efficient, safe, and sustainable alternative to methanol for extracting bioactive compounds from olive mill waste and that DES extraction combined with supercritical CO₂ extraction can be classed as a green process. Graphic Abstract: [Figure not available: see fulltext.]

© 2019, Springer Nature B.V.

Deep eutectic solvent extraction

Green process

Hydroxytyrosol recovery

Olive mill wastes

Supercritical fluid extraction

Carbon dioxide

Chlorine compounds

Efficiency

Effluent treatment

Ethylene

Ethylene glycol

Eutectics

Methanol

Mixtures

Recovery

Supercritical fluid extraction

Supercritical fluids

Bioactive compounds

Deep eutectic solvents

Extraction efficiencies

Green process

Hydroxytyrosol

Olive-mill waste

Pressure and temperature

Supercritical CO₂ extraction

Organic solvents