Performance of phenolic compounds extraction using natural deep eutectic solvents based on choline chloride

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PURPOSE OF THE ABSTRACT
Phenolic compounds are a wide group of plant secondary metabolites with increasing interest due to their antioxidant ability and marked effects on oxidative processes related to several chronic diseases [1]. Nowadays, they found applications in pharmaceutical products, functional foods and natural-based cosmetics. Therefore, the extraction and identification of these valuable compounds from different plants have become a major research area. Nevertheless, conventional solid-liquid extraction of phenolics usually involves the use of flammable, toxic and volatile organic solvents [2, 3].

In recent years, ionic liquids (ILs) and deep eutectic solvents (DES) have been applied in several reaction and separation processes, often resulting in a safer alternative to volatile organic solvents [4]. In particular, DES are a group of new solvents characterized by their negligible volatility at room temperature, water miscibility, non-flammability and high viscosity [5]. A DES results from the combination of a hydrogen bond donor and a hydrogen bond acceptor, having the resultant mixture a lower melting point than any of the individual components [6].

Juglans regia L. (walnut) leaves were chosen as a plant model as they are considered a source of bioactive compounds, also used in traditional medicine. A previous study has shown that phenolic acids and flavonoids are the main constituents of this bioresource [7]. In the present work, preliminary results will be presented on the maceration extraction of phenolic compounds from walnut leaves using choline chloride ([Ch]Cl) based DES. Three main groups of DES were tested ([Ch]Cl - sugars; [Ch]Cl - alcohols; [Ch]Cl - acids) and their extraction capability was compared to that of conventional water and ethanol solvents. The extraction yield attained by different DES was determined by HPLC-DAD based on the sum of the response of the three most abundant compounds (3-O-caffeoylquinic acid, quercetin 3-O-glucoside and quercetin O-pentoside).

Overall, concerning the extraction yield (mg/g dw), DES based on [Ch]Cl - acids showed a better performance than [Ch]Cl - alcohols and [Ch]Cl - sugars. [Ch]Cl - propanoic acid was the best DES (29.2 mg/ g dw), [Ch]Cl - ethylene glycol resulted in the highest yield in the alcohols group (20.7 mg/ g dw), while [Ch]Cl - xylitol (7.4 mg/g dw) was the optimal sugar based DES. Under the same extraction conditions (0.03 g/mL, 20% (wt) water content, 50 ºC, 60 min, 600 rpm), all DES led to higher yields than water (6.0 mg/g dw) or ethanol (10.3 mg/g dw) and the DES based on [Ch]Cl - acids attained similar or superior yields than those obtained with ethanol:water mixture at
50% v/v (20.6 mg/g dw).
KEYWORDS
Biomass | deep eutectic solvents | phenolic compounds extraction

BIBLIOGRAPHY