GREEN EXTRACTION OF CAFFEINE FROM FOOD AND BEVERAGES USING DEEP EUTECTIC SOLVENT

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Caffeine, as one of the most commonly used alkaloids, has been mainly extracted from natural products using organic solvents that have disadvantages such as lower extraction yield and environmental toxicity. Deep eutectic solvents (DESs) as “green” and environment-friendly solvents possess a number of good properties such as high dissolving capacity, non-flammability, absence of toxicity, easy preparation and low cost. The aim of this paper is the extraction of caffeine from food and beverages using ultrasound-assisted DES (UAE-DES), as well as two other green techniques, ultrasound (UAE) and microwave-assisted extraction (MAE).

UAE-DES extraction of caffeine was performed on nine food and drink samples, using menthol:methyl salycilate in molar ratio 1:1. UAE was carried out in an ultrasonic bath with an ultrasonic input power of 250 W and a frequency of 40 kHz. MAE was performed in microwave oven with temperature and pressure control in vessels and power of 400 W. UAE and MAE used water as solvent. High-performance liquid chromatography method was applied for caffeine analysis.

The results showed that the most effective extraction method for all samples was UAE-DES, and the least effective was UAE. UAE-DES extraction provided amounts of caffeine which correspond to the declared values of the products while the other extraction methods gave significantly lower values. This can be attributed to the fact that hydrophobic DES is an excellent extractive media capable of extracting non-polar organic substances.

It can be concluded that DES could be widely used as an effective solvent for caffeine extraction from food and beverages, especially considering its environment-friendly nature and low cost.

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