

Vortex-assisted liquid-liquid microextraction of selected non-steroidal anti-inflammatory drugs using supramolecular solvent

Abid Jan, Jasmin Shah*, Muhammad Rasul Jan

Institute of Chemical Sciences, University of Peshawar, Khyber Pakhtunkhwa, Pakistan, Tel. 92-91-9216652; email: jasminshah2001@yahoo.com (J. Shah), abidjan0332@gmail.com (A. Jan), rasuljan@yahoo.com (M.R. Jan)

Received 24 August 2021; Accepted 23 March 2022

ABSTRACT

An eco-friendly efficient supramolecular solvent-based method was developed for extraction and determination of selected non-steroidal anti-inflammatory drugs (NSAIDs) such as diclofenac sodium, caffeine and paracetamol in water samples followed by detection with high-performance liquid chromatography. Supramolecular solvent (SUPRAs) with composition of 400 μL of 1-undecanol as reverse micelles in dispersing solvent of 15% tetrahydrofuran (THF) solution in water at pH 4 used as extracting solvent for selected NSAIDs. Various factors affecting the extraction efficiency of NSAIDs like amount of 1-undecanol, percentage of THF, composition of SUPRA, pH, vortex time and sample amount were studied. Limit of detection ($S/N = 3$) and quantification ($S/N = 10$) were 0.02 and 0.08 $\mu\text{g mL}^{-1}$ for paracetamol, 0.006 and 0.02 $\mu\text{g mL}^{-1}$ for caffeine, 0.06 and 0.2 $\mu\text{g mL}^{-1}$ for diclofenac sodium with linear range of 0.1–12 $\mu\text{g mL}^{-1}$. The inter-day relative standard deviation (RSD) values were 3.1%–5.2%, 3.3%–4.2% and 2.2%–3.6%, while for intra-day the RSD values obtained were 2.4%–4.1%, 1.4%–3.1% and 1.5%–4.1% for paracetamol, caffeine and diclofenac sodium, respectively. The proposed method has been applied successfully to the spiked water samples and recoveries were found in the range of 89.5%–94.6% for tap water, 88.5%–92.8% for canal water and 90.0%–95.2% for industrial wastewater samples was obtained.

Keywords: Supramolecular solvent; Microextraction; 1-undecanol; Paracetamol; Caffeine

* Corresponding author.