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Determination of benzodiazepines in beverages using green extraction methods and capillary HPLC-UV detection

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Highlights:

- Quantification of eight benzodiazepines in three commercial beverages
- DLLME and MEPS are used for sample preparation
- Capillary UHPLC-UV analysis
- Green analytical chemistry

Abstract

Dispersive liquid-liquid microextraction with and without ultrasound assistance (DLLME, UA-DLLME) and microextraction with packed sorbent (MEPS) methods for the extraction and determination of eight different benzodiazepines (BDZ) (chlordiazepoxide, flurazepam, bromazepam, oxazepam, lorazepam, clobazam, clonazepam, and flunitrazepam) in three commercial non-alcoholic and light alcoholic beverages were optimized and compared. Benzodiazepines are frequently used for their extensive diffusion and strong numbing effect in drug-facilitated crimes (DFC). The tiny small amount of sample required for DLLME and MEPS extraction makes them very suitable for specimens collected at the crime scene of DFCs. Microextraction techniques are of increasing interest thanks to their accordance to green analytical chemistry (GAC) guidelines providing good recovery values. Ultrasound assistance (UA-DLLME) was used to investigate whether this type of energy can improve the recoveries of the analytes. Analyses of the extracts were performed with reverse-phase capillary high-performance liquid chromatography with UV detection (HPLC – UV), thanks to low environmental impact, robustness, diffusion, and affordability. Recovery percentages at three different concentrations in the three beverages were between 14.30% and 103.28% with intraday and interday RSD lower than $\pm$ 2.78%. The same samples were extracted using a MEPS protocol, and the results were compared with those obtained with DLLME. MEPS gave recoveries between 20.90% and 101.88% for all matrices showing a better performance than DLLME at higher concentrations, though lower recoveries were observed with diluted samples.

Abbreviations

ACN Acetonitrile