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Lab-made automated parallel-dispersive pipette extraction device for the determination of PAHs in distilled beverages using HPLC-DAD

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Palavras Chave: *DPX, Prototype, Automation, Lab-made, Automated, Polycyclic aromatic hydrocarbons.*

Highlights

Lab-made automated parallel-dispersive pipette extraction device for determination of polycyclic aromatic hydrocarbons in distilled beverages.

Resumo/Abstract

PAHs can be formed by both natural and anthropogenic sources, such as the processing of petroleum, industrial activity and motor vehicle exhaust. A common source of contamination by PAHs in daily life is found in foods, which may be the result of industrial processes like roasting, burning and drying. Due to the hazardous effects of PAHs on human health and the maximum limits allowed by international commissions, it is of extreme importance to develop methods in order to monitor these analytes in sugarcane spirit beverages. So, aiming increases analytical frequency, reduces health risks for the analyst, and enhances efficiency and precision, our laboratory designed the prototype Au-Pa-DPX. This work describes the development of a new automated parallel dispersive tip microextraction method (Au-Pa-DPX) for the determination of eleven polycyclic aromatic hydrocarbons (PAHs) in four samples of Brazilian sugarcane spirit beverages, with separation and detection done by the HPLC-DAD. The results obtained with the Au-Pa-DPX approach were also compared with those obtained via the conventional parallel manual DPX method with the same samples and optimized extraction process. Desorption solvent and cycles of desorption, cleaning and extraction were optimized using response surface methodology and univariate approaches. For the Au-Pa-DPX method, the coefficient of determination (R^2) ranged from 0.9948 to 0.9997. The limits of detection and quantification were all 0.3 μg L^{-1} and 1.0 μg L^{-1}, respectively. Interday and intraday precision ranged from 7.6% to 31.7% and 0.40% to 15.8%, respectively. For the manual parallel DPX method, the interday and intraday precision ranged from 8.2% to 38.1% and 5.40% to 18.7%, respectively. The relative recovery values obtained with the proposed method ranged from 53.2 to 124.9%. The enrichment factors ranged from 15 to 22. The sum of PAH concentrations in the four samples ranged from undetected to 25.5 μg L^{-1}. These results, when correlated to other methods, highlight the gains in regard to precision obtained with the automated apparatus. Furthermore, when compared to other methods from the literature, it is an interesting green alternative for the determination of these analytes and this sample, with high throughput (4.67 min per sample), low consumption of solvents and samples, generating less waste and reducing health risks to the analyst.

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