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Simultaneous determination of Brilliant green and Crystal Violet dyes in fish and water samples with dispersive liquid-liquid micro-extraction using ionic liquid followed by zero crossing first derivative spectrophotometric analysis method

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Abstract

In this study, dispersive liquid-liquid micro-extraction using ionic liquid (IL-DLLME) combined with zero crossing first derivative spectrophotometric method was applied to quantitative determination of triphenylmethane dyes in binary mixtures. The 1-methyl-3-octylimidazolium hexafluorophosphate [OMIM][PF₆] ionic liquid was used to extract Brilliant Green (BG) and Crystal Violet (CV) dyes from aqueous solutions. The amplitude of the zero crossing first derivative spectra at 670 nm and 532 nm were selected for the determination of BG and CV, respectively. Significant factors influencing the extraction of BG and CV such as sample pH, kind of extraction solvent, amount of extractant, extraction and centrifuging times and ionic strength were investigated. Under the optimal conditions, the calibration curves for the simultaneous determination of both dyes were found to be linear in the range of 10-500 $\mu\text{g L}^{-1}$ with detection limits (LODs) of 2.7 $\mu\text{g L}^{-1}$ and 1.4 $\mu\text{g L}^{-1}$ for BG and CV, respectively. The relative standard deviation (RSD%) for five replicate simultaneous determinations of BG and CV were 4.7% and 1.7%, respectively. Extraction efficiencies of the BG and CV dyes in the presence of interfering ions were also investigated. Sample preparation based on the quick, easy, cheap, effective, rugged and safe (QuEChERS) extraction combined with the IL-DLLME method and zero crossing first derivative spectrophotometric detection was applied for the simultaneous analysis of BG and CV in fish and water samples with quantitative recoveries.

Keywords: Crystal Violet; Brilliant Green; Dispersive liquid-liquid microextraction; Derivative spectrophotometry; Food analysis

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