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Rapid determination of hydrophilic phenols in olive oil by vortex-assisted reversed-phase dispersive liquid-liquid microextraction and screen-printed carbon electrodes

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Abstract

A novel approach is presented to determine hydrophilic phenols in olive oil samples, employing vortex-assisted reversed-phase dispersive liquid-liquid microextraction (RP-DLLME) for sample preparation and screen-printed carbon electrodes for voltammetric analysis. The oxidation of oleuropein, hydroxytyrosol, caffeic acid, ferulic acid and tyrosol was investigated, being caffeic acid and tyrosol selected for quantification. A matrix-matching calibration using sunflower oil as analyte-free sample diluted with hexane was employed to compensate matrix effects. Samples were analyzed under optimized RP-DLLME conditions, i.e., extractant phase, 1 M HCl; extractant volume, 100 µL; extraction time, 2 min; centrifugation time, 10 min; centrifugation speed, 4000 rpm. The working range showed a good linearity between 0.075 and 2.5 mg L^{-1} (r=0.998, N=7) for caffeic acid, and between 0.075 and 3 mg L^{-1} (r=0.999, N=8) for tyrosol. The methodological limit of detection was empirically established at 0.022 mg L^{-1} for both analytes, which is significantly lower than average contents found in olive oil samples. The repeatability was evaluated at two different spiking levels (i.e., 0.5 mg L^{-1} and 2 mg L^{-1}) and coefficients of variation ranged from 8 to 11% (n=5). The applicability of the proposed method was