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Determination of the antioxidant capacity of the micellar extracts of spices in Brij® 35 medium by differential pulse voltammetry

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Abstract

© 2016, Pleiades Publishing, Ltd. It was established that the micellar extracts of spices are electrochemically active on a glassy carbon electrode modified with cerium dioxide nanoparticles in a 0.02 M Brij® 35 in the presence of a phosphate buffer solution (pH 7.4) under the conditions of differential pulse voltammetry. The number of oxidation steps and their potentials vary over a wide range depending on the type of spice. A number of the oxidation peaks of the micellar extracts of spices were identified based on the oxidation potentials of the following individual antioxidants: gallic acid, ferulic acid, p-coumaric acid, caffeic acid, rosmarinic acid, thymol, eugenol, vanillin, syringaldehyde, capsaicin, rutin, quercetin, catechin, tannin, and curcumin. The contribution of the main antioxidants to the amperometric response of the extracts was confirmed by the standard addition method. A procedure for the voltammetric determination of the antioxidant capacity of the extracts of spices based on the oxidation of their antioxidants was developed. The antioxidant capacity of spices was evaluated from the total area of the oxidation steps in units of gallic acid, whose analytical range, detection limit, and determination limit were 50–2490, 11.9, and 39.6 μM , respectively. Twenty types of spices were analyzed. Positive correlations of the antioxidant capacity with the ferric reducing power and the antioxidant activity ($r = 0.8971$ and 0.9127 , respectively at $r_{\text{crit}} = 0.497$) were found.

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Keywords

antioxidant capacity, Brij® 35, food analysis, micellar media, spice, voltammetry