

Ultrasound-assisted micellar extraction of phenolic antioxidants from spices and antioxidant properties of the extracts based on coulometric titration data

Ziyatdinova G., Ziganshina E., Cong P., Budnikov H.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© The Royal Society of Chemistry 2016. Ultrasound-assisted micellar extraction of phenolic antioxidants from spices has been developed for the first time. The effect of the surfactant nature and its concentration on the extraction efficiency has been evaluated. Electrogenerated hexacyanoferrate(III) ions have been used as coulometric titrants owing to their selectivity towards phenolic antioxidants. The best recovery of phenolic antioxidants has been obtained using nonionic 0.1 mol L⁻¹ Brij® 35 micellar medium by single extraction for 10 min with ultrasound treatment. The spice/extractant ratio that provided maximum recovery of phenolic antioxidants was found for 20 spices. Comparisons with ethanolic and methanolic extracts have been performed. Micellar extracts show significantly higher recovery of phenolic antioxidants. Reactivities of the individual phenolic antioxidants of the spices with electrogenerated hexacyanoferrate(III) ions, bromine and Ce(IV) in Brij® 35 micellar medium have been found. The antioxidant properties of the spices' micellar extracts have been estimated using total antioxidant capacity (TAC), ferric reducing power (FRP) and ceric reducing/antioxidant capacity (CRAC) based on their reactions with coulometric titrants (the electrogenerated bromine, hexacyanoferrate(III) ions and Ce(IV), respectively). Positive correlations of these parameters with antioxidant activity towards 2,2-diphenyl-1-picrylhydrazyl (DPPH) ($r = 0.8676$, 0.9502 and 0.8855 for TAC, FRP and CRAC, respectively) have been obtained.

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