

Novel Coulometric Approach to Evaluation of Total Free Polyphenols in Tea and Coffee Beverages in Presence of Milk Proteins

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Abstract

Electrogenerated hexacyanoferrate(III) ions have been used as coulometric titrant for the determination of total free polyphenols in beverages. Stoichiometric coefficients of natural flavonoids (rutin, quercetin, and taxifolin) in their reaction with $[\text{Fe}(\text{CN})_6]^{3-}$ ions were established. The number of electrons involved in the oxidation corresponds to number of phenolic OH groups in the molecule of polyphenols. Proteins (casein and bovine serum albumin) bind polyphenols in the complexes that leads to significant decrease of free polyphenols portion (in the range of 5-76%). Ferric reducing power (FRP) of eight tea and 17 coffee samples was determined. The absolute FRP values ranged from 224 to 405 and from 241 to 488 C cup⁻¹ for tea and coffee, respectively. Effect of milk proteins on total free polyphenols of tea and coffee and appropriate alteration of beverages FRP were evaluated. Milk addition decreases FRP of drinks in the range of 10-70% reflecting high content of inactive polyphenols. © 2010 Springer Science+Business Media, LLC.

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Keywords

Antioxidant properties of beverages, Constant-current coulometry, Electrogenerated hexacyanoferrate(III) ions, Food analysis, Milk proteins, Polyphenolic antioxidants