

Abstract

Characterization of Essential Oil Antioxidant Properties by Coulometric Titration †

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Abstract: Essential oils have been known about since ancient times and have been used in aromatherapy. Nowadays, their applications also cover the medicine and food industries due to their wide spectrum of bioactivity, including antioxidant properties. Thus, the estimation of essential oils' antioxidant properties is of practical interest. Phenolic compounds and terpenes are the major antioxidants present in essential oils according to gas chromatography-mass spectrometry (GC-MS). Total antioxidant parameters are a good alternative to the characterization of individual components by GC-MS, allowing the avoidance of a time-consuming and expensive procedure. Coulometric titration with electrogenerated bromine and ferricyanide ions has been used for the estimation of the total antioxidant capacity and the ferric reducing power of essential oils for the first time. Data on the reaction of individual antioxidants (volatile phenolics and terpenes) with coulometric titrants confirm the applicability of the method for the characterization of essential oils' antioxidant properties. The essential oils clove, cinnamon, nutmeg, lavender, ginger, anise, basil, bergamot, jasmine, ylang-ylang, marjoram, neroli, rosemary, thyme, and clary sage of various trademarks (total 27 samples) are investigated. The data are compared to the standard parameters (antioxidant activity towards 2,2-diphenyl-1-picrylhydrazyl and the total phenolic contents). Positive correlations with coefficients from 0.7051 to 0.9558 confirm the accuracy of the coulometric approach. Moreover, the ferric reducing power reflecting the phenolic antioxidant content can be used for all samples of essential oils, while the Folin–Ciocalteu method for total phenolic contents is applicable to four essential oils only. Another advantage of coulometry titration is the possibility of automation and its rapidity, making it an attractive tool for screening purposes in routine practice.

Keywords: electroanalysis; coulometry; electrogenerated titrants; antioxidants; total antioxidant parameters; essential oils



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