Correlation between the Cinnamic Acid Derivatives Antioxidant Efficiency and their Distribution in Model Food Emulsions

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In fluid emulsions, antioxidants (AO) distribute between the oil, interfacial and water regions of an emulsion. Their distributions depend on pH, AO molecular structure and polarity and on other emulsion component such as oil and surfactant type. In this work, a kinetic method that does not require isolation of phases was employed to estimate the partition constants of AO between the oil, interfacial and water phase. This method [1] is grounded in the pseudophase model for thermodynamically stable microemulsions and exploits the reaction of 4-hexadecylbenzenediazonium ions, 16-ArN2+, trapped at the interfacial region of the emulsion, with antioxidants. The observed rate constant (kobs) of the reaction is monitored by employing a derivatization method based on trapping unreacted arenodiazonium ion as an azo dye.

A large serie of dihydroxycinnamates of C1-C16 fatty acids with increasing lipophilicity were synthesized from the corresponding half esters of malonic acid and benzaldehyde derivatives by Knoevenagel condensation[2]. No differences were observed in the radical scavenging activity between compounds and caffeic acid using the DPPH test. However, the observed antioxidant activity in water/tween 80/olive oil emulsions was highest for esters of caffeic acid. The Schall Oven assay showed a growing antioxidant capacity, with respect to caffeic acid from the C1 ester to the C8 ester derivative and then a decrease to the C16 derivative. The calculated percentages of compounds in the different phases show that the C8 ester was the compound with the highest concentration at the interface region. These results suggest that there exists a positive correlation between the antioxidant efficiency and distribution. The results are relevant for interpreting the effects of lipophilization of antioxidants on their efficiencies.

[1] V. Sánchez-Paz, M.J. Pastoriza-Gallego, S. Losada-Barreiro, C. Bravo-Díaz, L.S. Romsted, *Colloid Inteface Sci*, **320**, 1-8 (2008).

[2] Menezes, J.C.M.D.S, Kamat, S.P., Cavaleiro, J.A.S, Gaspar, A. Garrido, J., Borges, F., *Eur J Med Chem*, **46**, 773-777 (2011).