

Quantitative Determination of Oleuropein and 3,4-DHPEA-EDA Distribution in Olive Oil/Tween80:Span 80/Water (HLB = 8) Food Emulsion

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In fluid emulsions, antioxidants (AO) distribute between the oil, interfacial and water regions of an emulsion. Their distributions depend on temperature, pH, AO molecular structure and polarity and on other emulsion component such as oil and surfactant type. To date, the primary approach to determine AO distribution has been done by analyzing the AO concentration in each phase after phase separation. 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 is grounded in the pseudophase model for thermodynamically stable microemulsions and exploits the reaction of 4-hexadecylbenzenediazonium ions, 16-ArN_2^+ , trapped at the interfacial region of the emulsion, with antioxidants. The observed rate constant (k_{obs}) of the reaction is monitored by employing a derivatization method based on trapping unreacted arenodiazonium ion as an azo dye.

Our results provided the first estimates of the oil/interfacial and water/interfacial transfer partition constants of oleuropein and 3,4-DHPEA-EDA, the most important polyphenolic compound found in olives and olive oil, respectively.

The calculated percentages of oleuropein in the different phases are quite independent on the oil to water ratio (Φ_o) but strongly dependent on the interfacial volume fraction (Φ_i). Our results show that oleuropein is mostly distributed between the interfacial (46-88%) and aqueous (12-54%) region of the emulsion, depending on the particular Φ_i value.

On the other hand, the calculated percentages of 3,4-DHPEA-EDA in the different regions of the emulsion were quite dependent on both Φ_i and Φ_o . Results show that much of this compound is also in the interfacial region (34-78%), with some at the water phase (12-43%) and at the oil phase (6-31%), depending on the particular Φ_i and oil to water ratio values.