

Distribution of Gallic Acid in a Model Food Emulsion

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In the present work we determined the distribution of gallic acid (HG) in Corn oil / acidic water / Tween 20 emulsions at different acidities. In emulsified systems the distribution of antioxidant is governed by two partition constants, one between the aqueous and interfacial region, P_W^I and the other between the oil and interfacial region, P_O^I .

P_O^I and P_W^I were determined at different pH by analyzing the effects of emulsifier concentration on the observed rate constants (k_{obs}) for the reaction between the hydrophobic 4-hexadecylarenediazonium ion ($16-ArN_2^+$) and HG and by determining spectrophotometrically the ratio $P_W^I / P_O^I = P_A^O$, that represents the partition constant of HG in binary corn oil-water system (that is, in the absence of emulsifier).

The k_{obs} values were determined by employing a derivatization method that exploits the rapid reaction between the arenediazonium ions and a coupling agent that yields a stable azo dye whose absorbance can be determined spectrophotometrically.

The results show that P_W^I is lower than P_O^I , in keeping with the hydrophilic nature of gallic acid. The antioxidant is mostly located in the interfacial and aqueous regions with negligible amounts in the oil region ($< 1\%$), in keeping with expectations based on the nature of HG. For example, in a 1:9 oil:water Tween 20 emulsions (pH 3,65 acetate buffer 0.04M), 87% of HG is located in the interfacial region at 0.04 vol. fraction of Tween 20. On lowering pH, the percentage of HG in the aqueous region decreases due to the lower ionization degree of carboxyl group of HG.

