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Caffeates as antioxidants in emulsions and the effect of tocopherols

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Lipid oxidation is a major issue in foods containing LC PUFA. To protect these food products antioxidant addition can be a solution. Many food products are emulsions. According to the “polar paradox” hypothesis, polar compounds are more efficient as antioxidants in bulk oil, whereas lipophilic compounds are more efficient antioxidants in emulsions. Lately, extensive work has been performed on phenolipids and their antioxidant efficacy in emulsions. It was found that the “polar paradox” hypothesis was too simple to explain the observed efficacy of the phenolipids. The antioxidant efficacy increased with increasing length of the alkyl chain up to a certain length after which the efficacy decreased. Therefore, a new term, “cut-off effect”, was introduced to describe this behavior.

The aim of this study was to evaluate the antioxidative effect of caffeic acid and its ester C₁ – C₂₀, caffeates, in two different emulsion systems. In the first system we used stripped fish-rapeseed oil (50:50) and for the second system we used non-stripped fish-rapeseed oil (50:50) and for both systems Tween80 was used as emulsifier. Hence, the first system was without tocopherol and the second system was with tocopherols from the oil. Lipid oxidation was evaluated from three parameters measured over time: peroxide value (PV), secondary volatile oxidation products and tocopherol concentrations. The results demonstrate the efficacy of caffeates in simple emulsions. Furthermore, the two different emulsion systems reveal possible interactions between caffeates and tocopherols in simple emulsions.

Keywords: Caffeic acid, Caffeates, Lipid oxidation, Cut-off effect