FORMULATION OF DELIVERY SYSTEMS FOR CAROTENOID-RICH EXTRACTS FROM MICROALGAE

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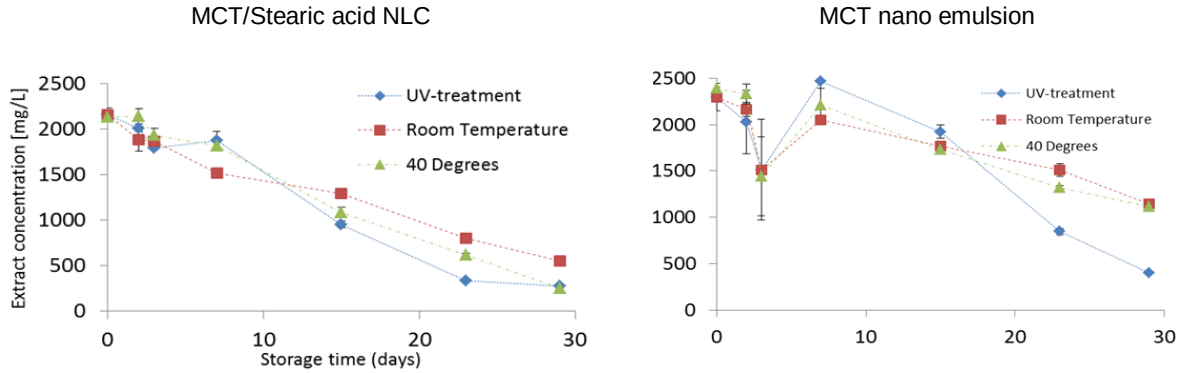
Abstract Text

High interest in dietary carotenoids stems from their antioxidant properties and ability to alleviate chronic diseases. However, carotenoids are very prone to oxidative degradation by a number of factors. The choice of delivery system used to incorporate hydrophobic carotenoids in aqueous matrices as well as the choice of ingredients and processing conditions will influence the chemical stability and eventual bioavailability of the carotenoids. Studies in the open literature report on the advantages of lipid nanoparticle dispersions over nanoemulsions in regards to their ability to protect single carotenoids against chemical degradation. However, it is uncertain whether such tendencies can be extrapolated to complex mixtures of carotenoids, such as those being produced during biorefinery separation processes. This aspect is addressed in the study described here where an extract from microalgae, containing approximately 30% w carotenoids (mostly β-carotene), was incorporated into o/w nanoemulsions and suspensions of nanostructured lipid carriers (NLC) prepared by means of high pressure microfluidisation. The physical stability of the delivery systems as well as the chemical stability of the carotenoids in these formulations under a different set of conditions was followed over time. Physical stability was assessed by monitoring variations in visual appearance and drop size distribution while chemical degradation of the carotenoids was followed by means of UV-vis spectrophotometry. Nanoemulsions and NLCs containing 0.25% of the extract and displaying good physical stability at room temperature over at least 2 weeks, were obtained with lecithin, medium chain triglycerides (MCT) as well as MCT /stearic acid and MCT/carnuba wax, respectively. Among these systems and contrary to what has been reported for single carotenoids, the nanoemulsion provided much better protection than the NLCs against carotenoid degradation. This finding is discussed in terms of the microstructure differences between NLCs particles and emulsion drops.



Variations in carotenoid concentration in NLC and nanoemulsion formulations as a consequence of chemical degradation under different storage conditions.

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