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A layer-by-layer approach for curcumin encapsulation for food applications

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Abstract

Driven by the consumers' needs for new, healthier and safer food products, the food industry is seeking for edible systems able to encapsulate, protect and release lipophilic functional compounds. Nanoemulsion-based technology offers the methodologies for encapsulate, protect and control release, while improving the solubility and bioavailability of these compounds.

The present work aimed at preparing stable curcumin nanoemulsions and multilayer nanoemulsions as potential bioactive compounds for food formulations.

Curcumin nanoemulsions and multilayer nanoemulsions were prepared using high-pressure homogenization and the electrostatic layer-by-layer deposition techniques, respectively. Chitosan was used to build the first and third layers, being the second layer formed by alginate. The size stability and zeta potential studies showed that both systems were stable in time, during storage (60 days), obtaining hydrodynamic diameters of 80, 110 and 140 nm for the nanoemulsion, second and third layer, respectively. Size stability against different pH's was also evaluated, being both nanosystems stable between the pH ranges of 2 to 12, where the pKa values of chitosan and alginate can influence the swelling and release of the multilayer nanoemulsions.

Curcumin release studies showed that only curcumin nanoemulsions allowed release of this compound; results clearly showed that the addition of biopolymers layers (multilayer nanoemulsions) reinforced the stability of these structures, avoiding curcumin release.

This work shows that it is possible to prepare multi-layer oil-in-water nanoemulsions through LbL technique using edible biopolymers and that this technology offers the potential to significantly improve solubility and bioavailability of bioactive compounds with different release kinetics profiles.

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