World Academy of Science, Engineering and Technology
International Journal of Nutrition and Food Engineering
Vol:10, No:08, 2016

Optimization of Microencapsulation of β-Carotene by Complex Coacervation Technique Using Casein and Gum Tragacanth

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Abstract : Microencapsulation of β-carotene was optimized by complex coacervation technique using casein/gum tragacanth (CAS/GT) coating as a function of pH, initial protein to polysaccharide mixing ratio (Pr:Ps), total biopolymer concentration, core material load, zeta potential, and ionic strength. This study was aimed to understand the influence of experimental parameters on the coacervation kinetics, the coacervate yield, and entrapment efficiency. At a Pr:Ps = 2:1, an optimum pH of complex coacervation was found 4.35, at which the intensity of electrostatic interaction was maximum. At these ratios of coating, the phase separation occurred the fastest and the final coacervate yield and entrapment efficiency was the highest. Varying the Pr: Ps shifted the value of optimum pH. This incident was due to the level of charge compensation of the CAS/GT complexes. Finally, electrostatic interaction and formation of coacervates between CAS and GT were confirmed by Fourier transform infrared (FTIR) spectra. The size and surface properties of coacervates were studied using scanning electron microscopy (SEM). The resultant formulation (β-carotene loaded microcapsules) was evaluated for in vitro release study and antioxidant activity. Stability of encapsulated β-carotene was also evaluated under three levels of temperature (5, 25 and 40 °C) for 3 months. Encapsulation strongly increased the stability of micronutrients. Our results advocate potential of microcapsules as a novel carrier for the safeguard and sustained release of micronutrient.

Keywords : β-carotene, casein, complex coacervation, controlled release, gum tragacanth, microcapsules
Conference Title : ICFPT 2016 : International Conference on Food Processing and Technology
Conference Location : Paris, France
Conference Dates : August 22-23, 2016