Optimization of Water/Oil/Surfactant System for Preparation of Medium-Chain-Length Poly-3-Hydroxyalkanoates (mcl-PHA)-Incorporated Nanoparticles via Nanoemulsion Templating Technique

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Abstract Polymeric nanoparticles gain a widespread interest in food and pharmaceutical industries as delivery systems that encapsulate, protect, and release lipophilic compounds such as omega-3 fatty acids, fat-soluble vitamins, carotenoids, carvedilol, cyclosporine, and ketoprofen. In this study, medium-chain-length poly-3-hydroxyalkanoate (mcl-PHA)-incorporated nanoparticle was developed via facile organic solvent-free nanoemulsion templating technique. The water content (W/surfactant-to-oil (S/O)), S/O, and Cremophor EL-to-Span 80 (Cremo/Sp80) ratios were first optimized using response surface methodology (RSM) to obtain nanoemulsion template prior to incorporation of mcl-PHA. Their effects on nanoemulsion formation were investigated. The mcl-PHA-incorporated nanoparticle system showed a good preservation capability of β-carotene and extended storage stability.

Keywords Polymeric nanoparticle · Biodegradable polymer · Medium-chain-length poly-3-hydroxyalkanoates · Phase inversion composition · Nanoemulsion templating

Introduction

The incorporation of bioactives into food and beverage products for the prevention of diet-related chronic diseases such as heart disease, diabetes, hypertension, and cancer is the