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Fabrication of fucoxanthin-loaded microsphere (F-LM) by two steps double-emulsion solvent evaporation method and characterization of fucoxanthin before and after microencapsulation (Article)

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Abstract

Microencapsulation is a promising approach in drug delivery to protect the drug from degradation and allow controlled release of the drug in the body. Fucoxanthin-loaded microsphere (F-LM) was fabricated by two step w/o/w double emulsion solvent evaporation method with poly (L-lactic-coglycolic acid) (PLGA) as carrier. The effect of four types of surfactants (PVA, Tween-20, Span-20 and SDS), homogenization speed, and concentration of PLGA polymer and surfactant (PVA), respectively, on particle size and morphology of F-LM were investigated. Among the surfactants tested, PVA showed the best results with smallest particle size (9.18 μm) and a smooth spherical surface. Increasing the homogenization speed resulted in a smaller mean F-LM particle size [d (0.50)] from 17.12 to 9.18 μm. Best particle size results and good morphology were attained at homogenization speed of 20 500 rpm. Meanwhile, increased PLGA concentration from 1.5 to 11.0 (% w/v) resulted in increased F-LM particle size. The mean particle size [d (0.5)] of F-LM increased from 3.93 to 11.88 μm. At 6.0 (% w/v) PLGA, F-LM showed the best structure and external morphology. Finally, increasing PVA concentration from 0.5 to 3.5 (% w/v) resulted in decreased particle size from 9.18 to 4.86 μm. Fucoxanthin characterization before and after microencapsulation was carried out to assess the success of the microencapsulation procedure. Thermo gravimetry analysis (TGA), glass transition (Tg) temperature of F-LM and fucoxanthin measured using DSC, ATR-FTIR and XRD indicated that fucoxanthin was successfully encapsulated into the PLGA matrix, while maintaining the structural and chemical integrity of fucoxanthin. © 2016 by Japan Oil Chemists' Society.

Author keywords

Fucoxanthin; Microencapsulation; Microsphere; Solvent evaporation method; W/o/w double emulsion

Indexed keywords

Engineering controlled terms: Chemical analysis; Controlled drug delivery; Emulsification; Evaporation; Fluorine; Glass transition; Microencapsulation; Microspheres; Morphology; Solvents; Surface active agents

Controlled release; Double emulsion-solvent evaporation; Double emulsions; Fucoxanthin; Mean particle size; Particle size and morphologies; Solvent evaporation method; Spherical surface

Engineering main heading: Particle size

EMTREE drug terms: drug carrier; emulsion; fucoxanthin; lactic acid; microsphere; polyglycolic acid; polylactic acid-polyglycolic acid copolymer; solvent; surfactant; xanthophyll

EMTREE medical terms: chemistry; drug formulation; emulsion; particle size; surface property; volatilization

MeSH: Drug Carriers; Drug Compounding; Emulsions; Lactic Acid; Microspheres; Particle Size; Polyglycolic Acid; Solvents; Surface Properties; Surface-Active Agents; Volatilization; Xanthophylls
Medline is the source for the MeSH terms of this document.

Chemicals and CAS Registry Numbers: fucoxanthin, 3351-86-8; lactic acid, 113-21-3, 50-21-5; polyglycolic acid, 26009-03-0, 26124-68-5, 26202-08-4; xanthophyll, 127-40-2, 52842-48-5;Drug Carriers; Emulsions; fucoxanthin; Lactic Acid; Polyglycolic Acid; polylactic acid-polyglycolic acid copolymer; Solvents; Surface-Active Agents; Xanthophylls