Co-solvent selection for supercritical fluid extraction of astaxanthin and other carotenoids from Penaeus monodon waste


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Abstract

In recent years, astaxanthin is claimed to have a 10 times higher antioxidant activity than that of other carotenoids such as lutein, zeaxanthin, canthaxanthin, and b-carotene; the antioxidant activity of astaxanthin is 100 times higher than that of a-tocopherol. Penaeus monodon (tiger shrimp) is the largest commercially available shrimp species and its waste is a rich source of carotenoids such as astaxanthin and its esters. The efficient and environment-friendly recovery of astaxanthin was accomplished by using a supercritical fluid extraction (SFE) technique. The effects of different co-solvents and their concentrations on the yield and composition of the extract were investigated. The following co-solvents were studied prior to the optimization of the SFE technique: ethanol, water, methanol, 50% (v/v) ethanol in water, 50% (v/v) methanol in water, 70% (v/v) ethanol in water, and 70% (v/v) methanol in water. The ethanolic extract produced the highest carotenoid yield (38.02 ± 0.8 µg/g dry weight (DW)) with 97.1% recovery. The ethanol extract also produced the highest amount of the extracted astaxanthin complex (58.03 ± 0.1 µg/g DW) and the free astaxanthin content (12.25 ± 0.9 µg/g DW) in the extract. Lutein and b-carotene were the other carotenoids identified. Therefore, ethanol was chosen for further optimization studies. © 2014 by Japan Oil Chemists’ Society.

Author keywords

Astaxanthin, Carotenoids, HPLC, Penaeus monodon, SFE

Indexed keywords

Engineering controlled terms:
- Astaxanthin
- Carotenoids
- HPLC
- Penaeus monodon
- SFE

Engineering main heading:
- Organic solvents

EMTREE drug terms:
- alcohol
- aspartic acid
- beta carotene
- canthaxanthin
- solid waste
- solvent
- xanthophyll

EMTREE medical terms:
- animal
- chemistry
- isolation and purification
- Penaeus
- procedures
- solid waste
- supercritical fluid chromatography

MESH:
- Animales
- Beta Carotene
- Canthaxanthin
- Chromatography, Supercritical Fluids
- Ethanol
- Lutein
- Penaeus
- Solvents
- Xanthophyll

Chemicals and CAS Registry Numbers:
- Alcohol, 64-17-5; astaxanthin, 472-61-7; beta carotene, 7235-40-7; canthaxanthin, 514-78-3; xanthophyll, 127-40-2, 52642-48-5; astaxanthin; beta Carotene; Canthaxanthin; Ethanol; Lutein; Solid Waste; Solvents; Xanthophyll

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