

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

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 β -carotene; the antioxidant activity of astaxanthin is 100 times higher than that of α -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 astaxanthins 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 ethanol extract produced the highest carotenoid yield ($84.02 \pm 0.8 \mu\text{g/g}$ dry weight (DW) with 97.1% recovery. The ethanol extract also produced the highest amount of the extracted astaxanthin complex ($58.03 \pm 0.1 \mu\text{g/g}$ DW) and the free astaxanthin content ($12.25 \pm 0.9 \mu\text{g/g}$ DW) in the extract. Lutein and β -carotene were the other carotenoids identified. Therefore, ethanol was chosen for further optimization studies.

Keyword: *Penaeus monodon*; Astaxanthin; Carotenoids; SFE; HPLC