Recovery of natural-based pigments from marine crustacean waste streams using Supercritical Fluid Technology

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In recent years, there is a growing interest in the development of natural colourants due to the health promoting effects of natural substances. Furthermore, the safety of synthetic food colourants has been related to high levels of toxicity, allergic reactions, and carcinogenic potential. Although synthetic dyes have lower production costs and greater stability, the European Union and the United States have restricted their use as food additives. In this field, carotenoid pigments provide a natural alternative to synthetic dyes. In this work, supercritical fluid extraction using carbon dioxide was explored to recover carotenoid pigments, namely astaxanthin, from marine crustacean waste streams.
Supercritical fluid extraction of brown crab (*Cancer pagurus*) shells using carbon dioxide and ethanol as co-solvent (5 %, wt) aiming the astaxanthin recovery was investigated. The impact of different operating conditions such as pressure (200, 325 and 450 bar), temperature (40, 50 and 60 ºC), equilibrium time (0, 15 and 30 min) and extraction flow rate (10, 15 and 20 g/min) on the process efficiency was studied and a factorial design of experiments and response surface methodology was applied to assess the best conditions. The extracts were analysed concerning the phytochemical content by state of art analytical techniques (HPLC-DAD-UV and LC-MS) and functional properties such as colour analyses (colour strength and CIELab colour parameters).
From the results obtained it can be concluded that supercritical fluid extraction technology can be considered as a good alternative to traditional solid-liquid extraction methods using organic solvents for the valorization of marine crustacean waste streams, allowing their subsequent use in nutraceutical formulations and functional foods.