

Shrimp processing waste as a source of antioxidant molecules for the pharma industry: a focus on green extraction strategies

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The recovery of waste biomass is a key point in the transition to a circular economy, favoring the reduction of environmental and economic impacts associated with its disposal and, at the same time, the procurement of biomolecules and biomaterials of industrial interest. Astaxanthin and chitin represent examples of valuable products occurring in shrimp shells wastes. To make the extraction process of these bioactive compounds more sustainable, the replacement of traditional solvents by hydrophobic natural deep eutectic solvents (NADES) was investigated. Specifically a NADES obtained by mixing menthol (ME) and acetic acid (AA) in a molar ratio of 1:1 was employed. The AXT extraction method proved to be fast and green, being complete in a short biomass-NADES contact time and requiring very low energy input. Ethanol, an bio-based solvent, was also found to be a good option for the extraction of AXT from shrimp shells. The AXT yields obtained by *Aristaeomorpha foliacea* wastes ranged around 350-370 µg/g with fresh powder. The Trolox equivalent antioxidant capacity (TEAC) of ME:AA and ethanol extracts was investigated, resulting higher than the one expected on the basis of AXT concentration alone, likely due to the co-extraction of additional antioxidants compounds. These results highlighted the potential of ME:AA and ethanol as ecological and efficient solvents for the recovery of bioactive molecules and confirm the strong antioxidant activity of shrimp shell extracts, which might find application in the pharmaceutical and nutraceutical field.