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Separation of bacterioruberin and proteins from Haloferax mediterranei using surface-active compounds

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PURPOSE OF THE ABSTRACT

The development of efficient technologies to ensure the sustainable use of marine resources is a goal established by the 2030 Agenda for Sustainable Development. Marine microorganisms present high potential as natural and renewable resources due to their many bioactive compounds, most notably pigments. Bacterioruberin is a C50 carotenoid produced by the archaea Haloferax mediterranei, which can be found in hypersaline environments such as marshes, salt ponds or salt lakes. Although poorly explored, this carotenoid structure confers it higher antioxidant capacity when compared with more common C40 carotenoids, such as ?-carotene. This property provides to bacterioruberin an enormous potential for applications in the food industry as a supplement and in the pharmaceutical industry as a skin cancer preventative or a skin tissue rehabilitator. Thus, simple, and sustainable procedures to recover bacterioruberin are needed to fully exploit its potential.

In this work, aqueous solutions of surfactants and ionic liquids were tested to extract bacterioruberin and proteins from Haloferax mediterranei ATCC 33500 in a multi-fractionation approach, unattainable with organic solvents. By analyzing the results and comparing the performance of the proposed solvents with ethanol, it was found that, despite their slightly lower yield, they allowed to extract both bacterioruberin and proteins present in the biomass, following a multi-product biorefinery approach. After identifying the most effective solvent, the process operating conditions were optimized by a response surface methodology using solid-liquid ratio, time of extraction and concentration of solvent as factors.

Next, protein precipitation was induced in a single step, with over 90 % of proteins recovered, whilst leaving the pigment in solution. Lastly, a polishing step of bacterioruberin was performed, envisioning the solvent recycling.

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FIGURES

FIGURE 1

FIGURE 2

KEYWORDS

bacterioruberin | surface-active compounds | protein | Haloferax mediterranei

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