

Extraction of Bioactive Microalgal Compounds from Bitterns of Solar Saltworks in Trapani and Paceco

Solar saltworks are extreme environments extensively studied that host diverse planktonic and benthic ecosystems [1]. Microalgae, bacteria, and archaea inhabiting these hypersaline habitats are recognized as natural producers of carotenoids, including C40 compounds, such as β -carotene, and C50 compounds, like bacterioruberin [2], [3]. Several studies highlight the growing market demand for these molecules, owing to their wide applications in the feed, food, pharmaceutical, and cosmetic industries. Currently, however, most carotenoids are produced via synthetic chemical processes, which are energy-intensive and environmentally unsustainable [4].

This project aims to develop a method for recovering carotenoids naturally produced by microorganisms in the bittern, that is the residual brine left over from solar salt production. Cell recovery represents the initial phase of carotenoid extraction. Subsequently, environmentally friendly solvents will be used to maximize carotenoid yield.

The first step is the identification of the microbial species present in the bittern and the characterization of the types of carotenoids produced. Understanding species composition, cell structure, and abundance is essential for optimizing harvesting techniques. It is also intended to assess the antioxidant properties of the carotenoids to evaluate their potential commercial value.

Several challenges must be addressed. These include the classification and quantification of relevant carotenoid-producing species. Optimizing cell and pigment harvesting is fundamental as well, given the high sensitivity of carotenoids to light and oxygen exposure. Potential solutions include the use of flow cytometry for cell counting and HPLC for carotenoid separation [5]. Computational tools may be used throughout the entire process, for example, to identify microbial strains, analyze carotenoids, and support process design and optimization.

Ultimately, the goal is to crystallize the carotenoids while simultaneously recovering the eco-friendly solvents used during the process from lab-scale to pilot scale. The advantage of this approach lies in the absence of cultivation costs, reducing the final product price.

References:

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