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Abstract

Stability of Bioactive Extracts from *Porphyridium purpureum* Microalgae Biomass under Various Stress Factors †

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1. Introduction

Nowadays, the interest for high-quality products of natural origin is increasing worldwide. Algae derived products have been recognized to have great potential as a rich source of bioactive compounds and their importance is growing rapidly. The bioactive compounds contained in algae extracts are proteins, unsaturated fatty acids, antioxidants (polyphenols, vitamin E, vitamin C) and other pigments (phycobiliproteins, carotenoids and chlorophylls). Such bioactive compounds have antibacterial, anti-inflammatory, antiviral, antifungal and antioxidative properties, with numerous health benefits. Algal extracts are widely used as biostimulants, bioregulators, nutritional supplements, pharmaceutical, food and cosmetics colorants [1]. The present study investigates the stability of bioactive extracts obtained from *Porphyridium purpureum* microalgae biomass subjected to a series of stress factors generated by exposure to a light source for different time intervals and at different temperatures.

2. Materials and Methods

Experiments were performed using *Porphyridium purpureum* microalgae strain from ICECHIM's strain collection, inoculated in its specific growth medium, ASW (artificial sea water). After cultivation, microalgae biomass was harvested, dried and grinded for more efficient processing. Extractions of bioactive compounds from *Porphyridium purpureum* powder were obtained using different solvents. For the phycobiliproteins extracts, a sodium phosphate buffer solution with a pH value of 6.8, was used, while for the chlorophylls and carotenoids extracts, the proposed solvents were acetone, methanol and ethanol. Various exposure times between 3 h and 40 h, at a light source with an intensity of 36.5 $\mu moli \cdot m^{-2}s^{-1}$ and temperatures between 30 °C and 70 °C were used. To observe and compare the stability of the extracts, the absorbances of the samples were measured spectrophotometrically at wavelengths specific to the biocompound monitored, before and after applying the stress factors.

3. Results

It was observed, in the case of the chlorophylls and carotenoids extract, that the presence of a light source played a more significant role on the stability of biocompounds, with up to 90% degradation after 40 h of exposure, no matter which extraction solvent was

used, with chlorophyll a being the most abundant pigment and at the same time the most vulnerable to degradation as a result of light exposure. In the case of using temperature as a stress factor, it was observed that for a lower temperature, of about 40 °C, the concentrations of both chlorophyll and phycobiliproteins extracts were reduced by a maximum of 20%, but when a higher temperature of 70 °C was proposed for the phycobiliproteins extract, a few minutes of exposure to this stress factor were sufficient to reach almost complete degradation of biocompounds.

4. Conclusions

Studies were carried out for the obtained sample of solvent containing the bioactive compounds, in order to evaluate their stability in different stress conditions. Light stress proved to be a more important factor for the stability of chlorophylls, while high temperatures led to faster degradation of phycobiliproteins.

Author Contributions: A.V. (Alin Vintila) and G.P. were responsible for the growth and harvesting of microalgae used in these experiments, M.C.-U. and A.V. (Alexandru Vlaicu) were responsible for obtaining and evaluating the stability of microalgae extracts, data processing and analysis, A.P. and A.-M.G. were responsible for supervising the experiments and writing the manuscript. All authors have read and agreed to the published version of the manuscript.

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