chemistry proceedings

Abstract

Screening Method for Microalgae with Bioremediation and Plant Biostimulant Potential †

Daria-Gabriela Popa [1,2], Eliza-Gabriela Mihaila [1,3], Diana Constantinescu-Aruxandei [1] and Florin Oancea [1,2,*]

1 National Institute for Research & Development in Chemistry and Petrochemistry–ICECHIM, 202 Spl. Independentei, 060021 Bucharest, Romania; daria.popa@icechim.ro (D.-G.P.); eliza-gabriela.mihaila@icechim.ro (E.G.-M.); diana.constantinescu@icechim.ro (D.C.-A.)
2 Faculty of Biotechnologies, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Bd. Mărăști nr. 59, 1 District, 011464 Bucharest, Romania
3 Power Engineering Faculty, University Politehnica Bucharest, Spl. Independenței nr. 313, 6 District, 060042 Bucharest, Romania
* Correspondence: florin.oancea@icechim.ro

† Presented at the 17th International Symposium "Priorities of Chemistry for a Sustainable Development" PRIOCHEM, Bucharest, Romania, 27–29 October 2021.

Keywords: microalgae; polluted waters; hydrocarbons; biomass; plant biostimulants

check for updates

Citation: Popa, D.-G.; Mihaila, E.-G.; Constantinescu-Aruxandei, D.; Oancea, F. Screening Method for Microalgae with Bioremediation and Plant Biostimulant Potential. *Chem. Proc.* **2022**, *7*, 26. https://doi.org/10.3390/chemproc2022007026

Academic Editors: Mihaela Doni, Zina Vuluga and Radu Claudiu Fierăscu

Published: 7 March 2022

Introduction: During the last decades, the high potential of microalgal products in different industrial and agricultural fields has been demonstrated [1]. Microalgae are a sustainable solution in many applications and challenges, from polluted water treatment to plant biostimulants. We aimed to develop a method to select microalgae strains capable of hydrocarbon biodegradation from those with plant biostimulant characteristics. Such strains could be further used in various applications, especially for bio- and/or rhizoremediation of hydrocarbons polluted water and soil. **Materials and Methods:** Three species of axenic microalgae, with plant biostimulant potential, Chlorella sorokiniana, Desmodesmus communis, and Raphidocelis subcapitata, were cultured in BG11 media in the presence of two long-chain alkanes, decane, and hexadecane, respectively. The concentrations tested were 1% and 5% *v:v*. The microalgae cultures were kept under atmospheric conditions of light and temperature, with daily orbital manual agitation. The optical densities, biomass quantities, and chlorophyll concentrations were used to determine the effect of the hydrocarbons on microalgae growth [2]. The residual alkanes were quantified at the end of the tests by the GC-MS method to evaluate the potential for bioremediation. **Results:** Both hydrocarbons stimulated the microalgae growth, especially C16 alkane, the variants with 5% hexadecane recording the highest amounts of weighed biomass. The cultures with Ch. Sorokiniana had almost four-fold higher biomass than control. The hydrocarbon peaks areas from GC-MS chromatograms decreased in the presence of microalgae, mainly in the cultures with Ch. Sorokiniana microalgae. **Conclusions:** Microalgae were capable of growing in hydrocarbon-supplemented growth media with high rates of alkane biodegradability. Ch. sorokiniana showed the highest efficiency in bioremediation. Furthermore, a significant increase in microalgae biomass quantities was obtained in the presence of 5% hexadecane. Microalgae cultivation in hydrocarbon presence increases the efficiency of producing microalgae biomass with plant biostimulants potential.

Author Contributions: Conceptualization, D.-G.P. and F.O.; methodology, D.C.-A.; software, F.O.; validation, E.-G.M. and D.C.-A.; formal analysis, D.-G.P.; investigation, E.-G.M.; resources, F.O.; data curation, D.C.-A.; writing—original draft preparation, D.-G.P.; writing—review and editing, D.C.-A. and F.O.; visualization, D.C.-A.; supervision, F.O.; project administration, E.-G.M.; funding acquisition, F.O. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by project POC-A1-A1.2.3-G-2015-P_40_352-SECVENT, My_SMIS 105684, “Sequential processes of closing the side streams from bioeconomy and innovative (bio) products resulting from it”, subsidiary project 1882/2020–Aqua-STIM. The SECVENT project was co-funded by European Regional Development Fund (ERDF), The Competitiveness Operational Programme (POC), Axis 1.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Lian, J.; Wijffels, R.H.; Smidt, H.; Sipkema, D. The effect of the algal microbiome on industrial production of microalgae. *Microb. Biotechnol.* **2018**, *11*, 806–818. [CrossRef] [PubMed]
2. Chai, S.; Shi, J.; Huang, T.; Guo, Y.; Wei, J.; Guo, M.; Li, L.; Dou, S.; Liu, L.; Liu, G. Characterization of Chlorella sorokiniana growth properties in monosaccharide-supplemented batch culture. *PLoS ONE* **2018**, *13*, e0199873. [CrossRef] [PubMed]