chemistry proceedings

MDPI

Abstract

Effect of Humic Acids from Biomass Biostimulant on Microalgae Growth †

Victor Alexandru Faraon [1,*], Daria Gabriela Popa [1,2], Ioana Tudor-Popa [1], Eliza Gabriela Mihăilă [1,3] and Florin Oancea [1,2,*]

[1] National Institute for Research & Development in Chemistry and Petrochemistry—ICECHIM, Bucharest, 202 Spl. Independentei, Sector 6, 060021 Bucharest, Romania; daria.popa@icechim.ro (D.G.P.); ioana.tudor.popa@icechim.ro (I.T.-P.); eliza.mihaila@icechim.ro (E.G.M.)
[2] Faculty of Biotechnologies, University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Marasti Blvd., Sector 1, 011464 Bucharest, Romania
[3] Power Engineering Faculty, Politehnica University of Bucharest, Splaiul Independenței 313, Sector 6, 060042 Bucharest, Romania
* Correspondence: victor.faraon@icechim.ro (V.A.F.); florin.oancea@icechim.ro (F.O.)
† Presented at the 17th International Symposium "Priorities of Chemistry for a Sustainable Development" PRIOCHEM, Bucharest, Romania, 27–29 October 2021.

Abstract: Humic substances (HSs) are formed by chemical and biological transformations of vegetal and animal biomass through microbial metabolism, representing a major organic carbon source at the soil's surface. They contribute to the adjustment of many major ecological processes. For example, HSs enhance plant growth and terrestrial life in general, adjust carbon and nitrogen cycles in the soil, enhance plant and microorganism growth, improve the fate and transportation of anthropogenic compounds and heavy metals and stabilize the soil [1,2]. Scientists define humic acids (HAs) as humic materials that are soluble in aqueous alkaline solutions and that precipitate when the pH is brought to 1–2 [3]. For lignin extraction from BSG, various DESs were used. Humification of the extracted lignin was carried out through a reaction with hydrogen peroxide in the presence of ferric sulphate heptahydrate. Biostimulant tests were conducted at 25 ± 2 °C, illuminating with a fluorescent light lamp at 100 µmol/m^2·s (µEinstein), with a light/darkness period of 14/10 h for 9 days up to 2 weeks. Parameters such as turbidity, optic density and chlorophyll content were studied. Concentrations of 10 mg/L and 1 mg/L in the case of reference products BJK and LSNa and of 1 mg/L in the case of the obtained HAs were used. Lignin was extracted with various yields. HAs were identified using FT-IR spectra. HAs derived from lignin had the best biostimulant activity in the period of 9 days for the 0.1 mg/L concentration. The biostimulant effect of various HAs showed promising results in every case, and the Has obtained from lignin had a better effect than the commercial product containing HAs after 9 days.

Keywords: humic acids; lignin; microalgae; biostimulant effect

Citation: Faraon, V.A.; Popa, D.G.; Tudor-Popa, I.; Mihăilă, E.G.; Oancea, F. Effect of Humic Acids from Biomass Biostimulant on Microalgae Growth. *Chem. Proc.* **2022**, *7*, 57. https://doi.org/10.3390/chemproc2022007057

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

Published: 28 March 2022

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

Funding: This work was supported by the POC-A1-A1.2.3-G-2015-P_40_352-SECVENT project, My_SMIS 105684, "Sequential processes of closing the side streams from bioeconomy and innovative (bio) products resulting from it", subsidiary project 1500/07.08.2020 BIOLIGNOL. The SECVENT project was co-funded by the 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. Canellas, L.P.; Olivares, F.L.; Aguiar, N.O.; Jones, D.L.; Nebbioso, A.; Mazzei, P.; Piccolo, A. Humic and fulvic acids as biostimulants in horticulture. *Sci. Hortic.* **2015**, *196*, 15–27. [CrossRef]
2. Halpern, M.; Bar-Tal, A.; Ofek, M.; Minz, D.; Muller, T.; Yermiyahu, U. The use of biostimulants for enhancing nutrient uptake. *Adv. Agron.* **2015**, *130*, 141–174. [CrossRef]
3. Klemm, D.; Heublein, B.; Fink, H.-P.; Bohn, A. Cellulose: Fascinating biopolymer and sustainable raw material. *Angew. Chem. Int. Ed.* **2005**, *44*, 3358–3393. [CrossRef] [PubMed]