proceedings

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Abstract

Bioremediation Strategy for Chromium-Contaminated Soils †

Cristina Firincă [1,2], Iuliana Răut [1], Maria-Lorena Jinga [1], Luiza Capră [1], Roxana Rodica Constantinescu [3], Ana-Maria Gurban [1], Lucian-Gabriel Zamfir [1], Mihaela Doni [1], Luiza Jecu [1], Mariana Constantin [1,4,*], Carmen Postolache [2] and Tatiana Eugenia Șesan [2,5]

[1] The National Institute for Research & Development in Chemistry and Petrochemistry—ICECHIM, 202 Spl. Independentei, 6th District, 060021 Bucharest, Romania; cristina.firinca@icechim.ro (C.F.); raut.iuliana@icechim.ro (I.R.); lorena.jinga@icechim.ro (M.-L.J.); luiza.capra@icechim.ro (L.C.); ana-maria.gurban@icechim.ro (A.-M.G.); lucian.zamfir@icechim.ro (L.-G.Z.); mihaela.doni@icechim.ro (M.D.); jecu.luiza@icechim.ro (L.J.)

[2] Department of Botany and Microbiology, Faculty of Biology, University of Bucharest, Splaiul Independentei 91-95, 50095 Bucharest, Romania; carmen.postolache@bio.unibuc.ro (C.P.); tatianasesan@yahoo.com (T.E.Ș.)

[3] National Research and Development Institute for Textile and Leather, Ion Minulescu 93, 3rd District, 031215 Bucharest, Romania; rodica.roxana@yahoo.com

[4] Department of Pharmacy, Faculty of Pharmacy, Titu Maiorescu University, 16 Bd. Gh. Șincai, 040441 Bucharest, Romania

[5] Academy of Agricultural and Forestry Sciences, Bd. Mărăști 61, 1st District, 011464 Bucharest, Romania

* Correspondence: mariana.constantin@icechim.ro

† Presented at the 19th International Symposium "Priorities of Chemistry for a Sustainable Development", Bucharest, Romania, 11–13 October 2023.

Keywords: bioremediation; soil; tannery industry; chromium; filamentous fungi

The tannery industry releases important amounts of chromium into the environment, its hexavalent form being highly toxic to all forms of life. The soil microbiota is an important component of terrestrial ecosystems because it influences the services and overall functioning of the soil [1]. Numerous fungal genera are able to survive in heavy-metal-contaminated environments, and even to reduce their concentration or to metabolize them to less toxic forms, through various resistance mechanisms [2]. For this reason, biological soil remediation methods are taken into consideration for their low costs, low negative impact on the environment as well as their role in ecological restoration [3]. The aim of the present study was to isolate heavy-metal-resistant filamentous fungi from chromium-contaminated soil to be applied in bioremediation.

Soil samples were collected from the surface layer in February 2023 from the proximity of a leather processing unit located in Bucharest. Physicochemical characterization, moisture and organic matter were determined by the loss on ignition method, and pH was analyzed using a glass electrode of hydrogen. Total chromium content was determined by ICP-MS. Several filamentous fungi were isolated on agar media supplemented with chloramphenicol and $K_2Cr_2O_7$. The tolerance index was assayed on agar media containing concentrations of chromium in a range of 50 to 1000 mg L^{-1}. Growth diameters were measured daily for 7 days, and the ratio between sample and control was compared. Values of the tolerance index between 0.80–0.99 indicated a high tolerance, and values equal or above to 1 indicated a very high tolerance [4]. Micro- and macroscopical observations were performed to identify any morphological modifications determined by interactions between the fungal strains and chromium.

Following physicochemical characterization, the soil proved to be low in moisture and organic matter, with a slightly alkaline pH. A number of 20 fungal strains were isolated, displaying various levels of tolerance to the concentrations of chromium tested. Most of the resistant strains were determined to belong to the *Trichoderma* sp. genera. Low concentrations of chromium proved to stimulate growth in a small number of strains, whereas

Citation: Firincă, C.; Răut, I.; Jinga, M.-L.; Capră, L.; Constantinescu, R.R.; Gurban, A.-M.; Zamfir, L.-G.; Doni, M.; Jecu, L.; Constantin, M.; et al. Bioremediation Strategy for Chromium-Contaminated Soils. *Proceedings* **2023**, *90*, 38. https://doi.org/10.3390/proceedings2023090038

Academic Editors: Florin Oancea and Radu Claudiu Fierăscu

Published: 19 December 2023

in others it produced macroscopic and microscopic changes represented by increased production of pigment and delayed sporulation.

Through our study, we have successfully isolated filamentous fungi that displayed various degrees of resistance to chromium. Further studies will be focused on analyzing the ability of the highly tolerant fungal strains to reduce the concentration of chromium in soil solution.

Author Contributions: C.F., I.R., M.-L.J., L.C., R.R.C., A.-M.G., L.-G.Z., M.D., L.J., M.C., C.P., T.E.Ș. contributed equally to this paper. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Ministry of Research, Innovation and Digitization through Core Program PN23.06.01.01.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: The authors thank the Ministry of Research, Innovation and Digitalization through Program 1—Development of the national research and development system, Subprogram 1.2—Institutional performance—Projects to finance excellence in RDI, Contract no. 15PFE/2021.

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

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