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Extracellular Organic Matter from *Micrococcus luteus* Enhances the Bioconversion of Used Lubricants in Polluted Soil

Attila Bodor[1,2,4], György Erik Vincze[1], Péter Petrovszki[1], Gábor Feigl[3], Naila Bounedjoum[1], Krisztián Laczi[1], Árpád Szilágyi[1], Gábor Rákhely[1,2,4], Katalin Perei[1,2]
[1]Department of Biotechnology, University of Szeged
Közép fasor 52., H-6726 Szeged, Hungary
[2]Institute of Environmental and Technological Sciences, University of Szeged
Közép fasor 52., H-6726 Szeged, Hungary
[3]Department of Plant Biology, University of Szeged
Közép fasor 52., H-6726 Szeged, Hungary
[4]Institute of Biophysics, Biological Research Centre
Temesvári krt. 62., H-6726 Szeged, Hungary

Extended Abstract

Lubricant oils (LOs) are petroleum products manufactured for reducing friction between mechanical moving parts of machines. Combustion products, heavy metals, polychlorinated and polyaromatic hydrocarbons (PCBs and PAHs) accumulate in LOs under normal operation, hence used lubricant oils (ULOs) can pose a serious risk to human health or natural environments [1]. With the utilization of microorganisms or plants, bioremediation offers environmentally sound and cost-effective techniques for the decontamination of polluted sites [2]. However, application of living organisms in the field can be difficult due to the transition of inoculated bacteria into viable but nonculturable (VBNC) state when facing environmental stresses. Extracellular organic matter (EOM) from *Micrococcus luteus* can reverse this transition or enhance the biodegradation performance both of native and augmented strains [3-4].

In this study, bench-scale *ex situ b*iodegradation experiments were performed for 60 days in order to decontaminate long-term ULO-polluted soils. Bioremediation approaches included natural attenuation (NA), biostimulation (BS), biostimulation-combined bioaugmentation (BAS), biostimulation supplemented with EOM (BS+EOM) and biostimulation-combined bioaugmentation supplemented with EOM (BAS+EOM). Results obtained from monitoring soil respiration, bioconversion efficiency, microbial cell counts and ecotoxicological parameters (e.g. soil catalase, soil dehydrogenase, seed germination) indicate that EOM-treatment enhances microbial activities and ULO-bioconversion rates both in *ex situ* biostimulated and bioaugmented systems of long-term polluted soil. After 60 days, the best biodegradation performance was achieved in BS+EOM and BAS+EOM samples with the ULO-bioconversion of 37.15% and 45.12%, respectively. Nevertheless, germination indexes in EOM-treated soils reached only 12.73% and 23.72%, respectively. Based on our observations, decreased hydrocarbon concentration did not necessarily correlate with the reduced phytotoxicity of the remediated soil.

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