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Enhanced Soil Bioremediation Processes by Mixed Enzymatic Complexes

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Editorial

This study examines if employing various enzymatic complexes to speed up the bioremediation of hydrocarbon-polluted soils is feasible. These complexes were produced by undefined mixed microbial consortia that were isolated from three various oil-contaminated sites at an oil refinery [1]. They were then enriched by regular aerobic cultivations using diesel hydrocarbons as the only carbon source [2]. Extracellular proteins mixtures were created by the three microbial consortiums during laboratory batch diesel biodegradation tests and after separation from the biomass and residual substrate, the production of proteins and the enzymatic activity were each assessed. These consortia's enzymatic activity followed a qualitatively similar trajectory and peaked at the exponential phase of the typical bacterial growth curve [3]. But the most active consortium was one of the consortia. To assess the effectiveness of batch bioremediation tests conducted as part of this investigation, the viability of adopting one of these enzymatic complexes that produced the best results to speed up microbial consortia's hydrocarbon removal from contaminated soil [4]. Unfortunately, petroleum hydrocarbon pollution of soil and groundwater is a widespread problem. Phenomenon that has major negative effects on the environment. Accidents, such as pipeline breakage or transportation mishaps, as well as inadequate waste-treatment procedures and the consequent pollutant discharge can all contribute to this contamination. One of the finest methods for cleaning up oil-contaminated soils is bioremediation because the technology is economical and safe for the environment. It was thought to be interesting to meet a specific study on the enzymatic bioremediation of these soils using the extracellular enzymes secreted by the microorganisms because the Department of Chemical Engineering already had extensive experience in the study of the bioremediation of soils contaminated with diesel hydrocarbons [5].

Therefore, three different microbial consortia derived from oil-contaminated soils and adapted to the degradation of diesel oil were used to carry out the bioremediation process of a diesel-contaminated soil, improved through the use of enzymatic complexes. First, it was investigated how microorganisms produced extracellular enzymatic complexes during the biodegradation of a prior batch of diesel. The next step is the viability of enhancing the microbial bioremediation of diesel oil-contaminated soils through the addition of such enzymatic complexes was investigated [6]. Three sites near an oil refinery in central Spain each yielded one soil tainted with diesel oil. The distinct consortia of unknown microorganisms included in these soils were isolated from these soils, preserved, and enriched over a period of many weeks, as stated below. These soils were characterised upon arrival at the laboratory. Five grammes of each soil sample were added to asal-enrichment medium broth in sterile flasks (BD, Franklin Lakes, NJ, USA, ref), and the bottles were shaken and incubator-shaked in an Ecotron for the duration of the night at rpm. Centrifuging was done on each water-soil suspension, and then the bottles were left in an Ecotron incubator-shaker overnight. The hydrocarbons used in this study were from a typical diesel fuel made from petroleum that was purchased from a gas station in Ciudad Real, Spain. Diesel oil has a density similar to that of crude oil and liquid petroleum products. Laboratory determination of density: hydrometer method) and its composition, estimated through a distillation curve at atmospheric pressure according to the Hysys Oil-Program Manager Aspen Technology, Inc. Burlington, Massachusetts, USA, was approximately 75% saturated hydrocarbons and 25% aromatic hydrocarbons. Using a diesel standard pattern Absolute Standards, it was also possible to determine the chain length of the n-alkanes. In a laboratory batch experiment, water suspensions of diesel-polluted soil were used. The extracellular enzymatic complex previously created by the same microbial consortia was also introduced, together with an inoculum of microbial consortia, to achieve the diesel biodegradation. The microbial consortium used was the one that produced the best results in the previous enzymatic activity experiments, namely the XC consortium supplemented with its own enzymatic complex. This was done to observe any potential improvements in the diesel degradation caused by the enzyme complex. A control experiment was also conducted under the same operating conditions, but without the addition of enzyme. The experiment involved adding BH broth to various Erlenmeyer flasks that had previously been filled with sterile. It may be concluded that the bioremediation method achieves a higher level of diesel degradation when extracellular enzymatic complexes produced by the microorganisms that break down the diesel are added. Additionally, it took less time to complete the process than the microorganism-only diesel bioremediation. Catalysts for the process are enzymes. Since the broth is supplemented with these enzymes throughout the enzymatic bioremediation process, the microorganisms may start the reaction earlier and produce a higher degradation yield. The use of this technology would depend on the final economic balance when weighing the expenses of producing the enzymes against the process improvement. The main distinction between the bioremediation process and the enzymatic-enhanced bioremediation process was that the latter produced more diesel degradation than the former did: whereas the former required approximately 175 hours to reach the same level of diesel degradation, the latter required approximately 60 hours. Conclusion It may be concluded that the bioremediation method achieves a higher level of diesel degradation when extracellular enzymatic complexes produced by the microorganisms that break down the diesel are added. Additionally, it took less time to complete the process than the microorganism-only diesel bioremediation.

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Conflict of Interest

None

References

1. Aguinga OE, McMahon A, White KN, Dean A P, Pittman JK (2018) Microbial community shifts in response to acid mine drainage pollution within a natural wetland ecosystem. Front Microbiol 9: 1445.
2. Sass AM, Sass H, Coolen MJ, Cypionka H, Overmann J (2001) Microbial communities in the chemocline of a hypersaline deep-sea basin (Urania basin, Mediterranean Sea). Appl Environ Microbiol 67: 5392-5402.
3. Wang S, Wu Y, Outten FW (2011) Fur and the novel regulator YqjI control transcription of the ferric reductase gene YqjI in Escherichia coli. J Bacteriol 193: 563-574.
4. Zhou D, Li Y, Zhang Y, Zhang C, Li X, et al. (2014) Column test-based optimization of the permeable reactive barrier (PRB) technique for remediating groundwater contaminated by landfill leachates. J Contam Hydrol 168: 1-16.
5. Ackerley DF, Gonzalez CF, Park CH, Blake R, Keyhan M, et al. (2004) Chromate-reducing properties of soluble flavoproteins from Pseudomonas putida and Escherichia coli. Applied and Environmental Microbiology 70: 873-882.
6. Chen S, Yang L, Hu M, J Liu (2011) Biodegradation of fenvalerate and 3-phenoxybenzoic acid by a novel Stenotrophomonas sp. strain ZS-S-01 and its use in bioremediation of contaminated soils Appl Microbiol Biotechnol 90: 755-767.