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"Gheorghe Asachi" Technical University of Iasi, Romania

TRIPHASIC SLURRY BIOREACTORS FOR THE BIOREMEDIATION OF LINDANE-IMPACTED SOIL UNDER AEROBIC AND ANAEROBIC CONDITIONS♣

Wendy E. Varo-Arguello[1], Beni Camacho-Pérez[1], Elvira Ríos-Leal[2], Pedro A. Vazquez-Landaverde[3], María T. Ponce-Noyola[4], Josefina Barrera-Cortés[5], Isabel Sastre-Conde[6], Noemí F. Rindernknecht-Seijas[7], Héctor M. Poggi-Varaldo[1*]

[1]*Environmental Biotechnology and Renewable Energies R&D Group, Department of Biotechnology and Bioengineering, CINVESTAV del IPN, P.O. Box 14-740, 07000 México D.F., México*
[2]*Central Analítica, Department of Biotechnology and Bioengineering, CINVESTAV del IPN*
[3]*CICATA-IPN, Qro., México*
[4]*Microbial Genetics Group, Department of Biotechnology and Bioengineering, CINVESTAV del IPN*
[5]*Control inteligente de Procesos, Department of Biotechnology and Bioengineering, CINVESTAV del IPN*
[6]*IRFAP, Conselleria d`Agricultura i Pesca, Palma de Mallorca, Islas Baleares, Spain*
[7]*ESIQIE del IPN, Mexico D.F., México*

Abstract

The objective of this study was two-fold: *(i)* to evaluate the effect of co-substrate supplementation and possible synergistic effect of the indigenous population and a lindane-acclimated inoculum on the removal of lindane in three-phase, aerobic slurry bioreactors (SB) , and *(ii)* to evaluate the effect final electron acceptor (O_2, CO_2 and SO_4^{-2}, or A, M, and SR, respectively) and supplementation with carbon source (sucrose, 1 and 0 g/L; C or NC, respectively) on the removal of lindane in triphasic lab scale SB. In a first experiment lindane was significantly removed in the first week of operation (55-70%); its reduction further continued at a lower rate. Both factors had a moderately significant effect; on the one hand, sucrose supplementation enhanced the removal of lindane ($p < 0.08$); on the other hand the indigenous microflora and lindane-acclimated inoculum exhibited some kind of antagonism ($p < 0.07$), since removals in SB with sterile soil were higher than those with live soil. In a second experiment, there was a significant effect of factor 'electron acceptors' on removal of lindane ($p < 0.0001$): lindane removal followed the order A > SR > M. Supplementation with sucrose had a significant positive effect ($p < 0.004$). Main metabolites from lindane degradation were chlorobenzene (CB), 1,2-dichlorobenzene (1,2-DCB) 1,3-dichlorobenzene (1,3-DCB) and 1,2,4-trichlorobenzene (1,2,4-TCB) in aerobic and sulfate reducing slurry bioreactors, only CB and 1,2-DCB were found in methanogenic units. Metabolites were consistent with those reported in aerobic and anaerobic degradation pathways of lindane.

Key words: bioremediation, clayish soil, lindane, slurry bioreactors, solvent, triphasic

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♣ **In memoriam Dr. Y.M. Cabidoche who made outstanding contributions to the remediation of soils polluted with chlordecone and other pesticides**

* Author to whom all correspondence should be addressed: e-mail: hectorpoggi2001@gmail.com; Phone: (5255) 5747 3800 ext 4324