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# SELECTION OF A DESORPTION TREATMENT FOR BIOREMEDIATION OF AN AGRICULTURAL SOIL POLLUTED WITH LINDANE

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## Abstract

An alternative for improving the bioremediation of hydrophobic compounds from soil is the use of surfactants and solvents, which can increase the availability and bioavailability of low solubility-, hydrophobic pollutants (pesticides, explosives, polycyclic aromatic hydrocarbons, chlorinated solvents etc.) in soil remediation. It has been shown that the differential availability enhancement factor (*AEF*) is a useful tool to quantitate the effect of desorption treatments. The *AEF* is defined as the ratio of the slope of the desorption curve of a given pollutant with a surfactant or solvent treatment to the slope of the corresponding desorption curve of a reference treatment, usually water. Thus, the objective of this study was to evaluate the effectiveness of several desorption/extractive treatments of lindane using the *AEF* as criterium.

The agricultural soil had high contents of organic matter (8%) and clay. Batch tests for determining the *AEF* using several desorption treatments with non ionic surfactants (Tergitol NP10 and Triton X-100, at 1.5 and 5 critical micellar capacity, cmc) and solvents (silicone and n-dodecane) for the system sterile soil-lindane were run. Desorption isotherms and the AEF values were obtained for each of the extractive treatments.

The *AEF* obtained were in the order silicone oil ~ Triton X-100 (5.0 cmc) > Tergitol NP10 (1.5 cmc) > Tergitol NP10 (5.0 cmc) >Triton X-100 (1.5 cmc) ≥ *n*–dodecane. Most AEF values were close to 1 or lower, that indicated a poor effectiveness of the desorption treatment. Best results were achieved with silicone oil and Triton X-100, with *AEF* values 2.2 and 2.1, respectively.

In this study the *AEF* value of the silicone oil-treated samples suggested an improvement of the availability of lindane by 112%. Furthermore, silicone oil is known to be innocuous to most microorganisms. Despite similar results of silicone oil and Triton, we chose the first for bioremediation studies because of its reported microbial innocuousness and possibility of recovery and reuse**.** In our case, the system was triphasic (soil-water-silicone oil); preliminary tests of silicone oil in slurry bioreactors showed promise for increasing lindane removal from the same model soil. These results were in agreement with those of Villemur et al. (2000) who observed that 69-88% of PAHs were transferred from soil to silicone oil in the two-liquid-phase slurry systems with 15% silicone oil, and improved bioremediation of petroleum-contaminated soil.

*Key words:* agricultural soil, desorption, lindane