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Biodegradation of both chlordecone and degradation products resulting from chemical treatment

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Chlordecone (CLD: $C_{10}Cl_{10}O$) is an organochloride insecticide used to control the banana weevil from 1972. Even its withdrawal in 1993, CLD is still present in drinking water and food crop products and impacts on human health have been documented since 2001. In soils, concentrations up to 15 mg/kg have been reported which also stress its high persistency. The depollution process of In Situ Chemical Reduction (ISCR) tested in laboratory conditions by BRGM enabled to reduce by 60-70% the CLD concentration in soil. It has successfully gone through a pilot test in a banana field in Martinique (French West Indies). This process breaks down the parent molecule in dechlorinated molecules (mainly mono, di and tri-hydro CLD), for which one it could be hypothesized that bioaccessibility via the dechlorinated region of the molecule may be facilitated as compared to the parent molecule. We have selected various inocula, based on their historical exposure to CLD, ability to degrade other highly chlorinated compounds (PCB...), or high bacterial activity. Their ability to degrade CLD and dechlorinated CLD was tested in feed-batch systems spiked with CLD and tri-hydro-CLD, for which ones we have standards in sufficient quantity to run such tests; synthesis of purified dechlorinated CLD still being a challenge. We have a methodology based on liquid extraction and GCMS to quantify simultaneously the parent compound and several of its metabolites to ensure distinguishing loss by sorption from degradation in the feed batches with solid support on which one the highly hydrophobic compounds can sorb on. Very preliminary results after 7-month incubation did not point out a clear distinction between biodegradation kinetics for CLD and the tri-hydro CLD. We also observe a biodegradation product for CLD resulting from the opening of carbonated cage of the molecule ($C_9Cl_5H_3$), which ones biodegradation steps are still unclear. Biodegradation tests are undergoing.