



HAL
open science

Chlordecone contamination of root vegetables in long term polluted soils in the FWI: analysis of level of pollution provides a decision tools for safe production

Magalie Lesueur Jannoyer, Raphaël Achard, Yves-Marie Cabidoche

► To cite this version:

Magalie Lesueur Jannoyer, Raphaël Achard, Yves-Marie Cabidoche. Chlordecone contamination of root vegetables in long term polluted soils in the FWI: analysis of level of pollution provides a decision tools for safe production. 5. International Symposium on Interactions of Soil Minerals with Organic Components and Microorganisms (ISMOM 2008), Nov 2008, Pucon, Chile. 298 p. hal-02758563

HAL Id: hal-02758563

<https://hal.inrae.fr/hal-02758563v1>

Submitted on 4 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

S4-O4**Chlordecone Contamination of Root Vegetables in Long-term Polluted Soils in the FWI: Analysis of Levels of Pollution Provides a Decision Tool for Safe Production****M. Lesueur Jannoyer^{1*}, R. Achard¹ and Y.M. Cabidoche²**¹PRAM CIRAD, Petit Morne, BP 214, 97285 LE LAMENTIN (FWI), Francia.²INRA, UR 135 Agropédoclimatique de la Zone Caraïbe, Domaine de Duclos, 97129 PETIT BOURG (FWI), Francia. *E-mail: jannoyer@cirad.fr

Chlordecone is an organochlorine pesticide whose use is now forbidden but which persists in soils. It was used as an insecticide against the banana weevil from the 1970s to the early 1990s in the French West Indies. Late contamination of root vegetables (RVs) was revealed in 2002. In our work, we studied the mode of transfer of chlordecone from different types of tropical soil (Andosol, Ferralsol and Nitisol) to different RVs (dasheen, yam, sweet potato, turnip and radish) to explore plant sensitivity to contamination. We conducted complementary experiments: surveys, field trials, and mesocosm trials to link soil chlordecone content with plant chlordecone contamination. In all those experiments, RVs contamination was heterogeneous as soil pollution was heterogeneous, but dispersion of the chlordecone molecule was the same for each crop. Due to this dispersion, the soil type did not significantly affect contamination. Average contamination values measured in harvested organs were positively correlated to chlordecone soil content. Belowground organs themselves were contaminated heterogeneously depending on where there was direct contact between the organ and contaminated soil. The cortex was more highly contaminated than the pulp (up to ten times more). These two results thus support the hypothesis that contamination by direct contact between the chlordecone molecule and the plant organ is the most important mode of transfer in RVs. This has already been demonstrated in the yam *Discorea cayenensis*, whose tubers were chlordecone free even when the root system explored contaminated soil. Chlordecone diffusion into the plant was very weak suggesting that it is a passive process in RVs. A common model, based on morphology and duration of the soil/organ contact, accounted for the RVs contamination. We calculated an envelope curve of the relationship between soil chlordecone content and RVs contamination and the maximum transfer ratio observed was 1/5. This envelope curve which represents zero risk of contamination was calculated for crops on both Andosol and Ferralsol. This relationship is thus a decision tool to determine whether or not there is a risk involved in cultivating roots and tubers based on the result of soil analysis. With this tool, the risk of contamination can be foreseen at planting which is preferable to analyzing the product at the harvest stage. Further studies are in progress to determine the sensitivity of other mainly horticultural crops and fruits, and to analyze the contamination of aboveground organs. Factors that govern the bioavailability of the chlordecone molecule in the soil for the plants, like water, organic matter content, type of clay, need to be analyzed in more detail to better understand chlordecone transfer to plants and thus improve pollution management.

Keywords: Organochlorine pesticide; soil pollution; food safety.
