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Mobility and sorption kinetics of biopesticide in soils

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Soils exhibit a marked affinity for hydrophobic organic compounds (HOCs) and therefore a permanent role in the environment and control fate of these chemicals. Nowadays, a broad-spectrum pesticide, rotenone, is used with strong restriction because of its environmental hazards. It is a heterocyclic organic compound, practically insoluble in water, and its environmental pathways and behaviour is rather unknown. In this study, we analyzed the impact of chemical and physical heterogeneity of soil on rotenone mobility and sorption kinetics. The sorption of rotenone on the soil surface from water solution was studied through a slurry-type experiment with on-line solid phase extraction using surface modified styrene divinylbenzene polymer as sorbent followed by high-pressure liquid chromatography. Sorption kinetics showed the equilibrium was reached in about 4 hours for all soils. In all cases the sorption is linear (C-type) over the whole range of rotenone concentration (0.05-0.5 mg/kg), indicating a constant partition of the rotenone between the solution and the soil surface. The sorptive uptake of the compound from liquid phase showed a positive correlation with the amount of soil organic matter. The soil with low organic matter content exhibited a slightly non linear sorption possibly attributed to a limited number of sorption site which become saturated with high rotenone concentration in the aqueous solution. Specific intermolecular interactions (rotenone-organic matter) can not be satisfactory explained with a simple partition model.