

Abstract

This paper provides quantitative information on the transfer of TBT (tributyltin) and TPhT (triphenyltin) from sludged soil to cultivated lettuce. The effect of their initial concentrations in the soil (varying from 20 to 50 $\mu\text{g}(\text{Sn}) \text{kg}^{-1}$ for each triorganotin), sludge amount (between 1% and 9%), and cultivation duration (32–54 days) was evaluated by means of experimental designs. The impact of the cultivation temperature at 13 °C and 19 °C on organotin fate in the soil/plant system was also considered. The final concentration of a given organotin in the plant roots was found to depend directly on its initial concentration in the soil. A total of $(85 \pm 15)\%$ of initial TBT in the soil was still present at the end of the experiments, regardless of the cultivation duration. Consequently, TBT appeared to be taken up by lettuce continually. A total of $(75 \pm 5)\%$ of TPhT was found to be degraded in the soil at 54 days. So, this compound could have been taken up by the plant at the beginning of the cultivation. Sludge amount seemed to have a negative effect on TPhT concentration in a plant at 32 days. This could be due to the quantitative TPhT sorption onto the sludge, observed just after spiking. Organotin plant uptake appeared to be more important at 19 °C than at 13 °C. TBT and TPhT were mainly accumulated in the roots, and up to 2% and 10% of TPhT and TBT, respectively, were translocated to the shoots. Despite TPhT degradation, products in large amounts were present in the soil and were not significantly taken up by the plant. They possibly remained immobilized on solid phases of the sludged soil.

Keywords: Butyltins; Phenyltins; Speciation; Sludged soil; Lettuce; Plant uptake