

ABSTRACT

Polychlorinated Biphenyls (PCBs) are a group of man-made organic chemicals known as chlorinated hydrocarbons. PCBs were banned in 1979 due to its toxicity and persistence in the environment. Variations of PCBs were determined in soils and plants. Degradation of PCB Aroclors and congener patterns were investigated from known contaminated site at a former Military Air Base. Bioaccumulation factors between plants and soils are assessed to indicate potential routes of entry to the food chain. PCB concentrations ranged between 17 - 1,040 $\mu\text{g L}^{-1}$ at 0 - 0.5 m depth, between 36 - 898 $\mu\text{g L}^{-1}$ at 1.0 - 1.5 m depth, between 20 - 73 $\mu\text{g L}^{-1}$ at 4 m depth and 21 $\mu\text{g L}^{-1}$ at 8 m depth. Total organic carbon was <1.0%. Soil particle size distribution was 4% gravel, 79% sand and 17% silt and 0% clay, while soil particle size outside the perimeter fence was 40% gravel, 46% sand and 14% silt and 0% clay. Moisture results ranged from 15% to 30%. A greater percentage of more chlorinated congener (i.e., heptaCB) is a result from contamination by Aroclor 1260. Surface soil obtained the highest leachate median value in PCBs. There is also a negative correlation between the mean of the Toxicity Characteristic Leaching Procedure (TCLP) of PCBs versus the sampling depth. Linear regression analyses were used to determine the correlation of the factors such as depth, Octanol/Water Partition Coefficient (K_{ow}) and solubility affected Soil/Water Distribution Coefficient (K_d). Effects were found only when the soil depth is at 0.3 - 0.5 m (at 95% confidence level). K_d is positively correlated with K_{ow} while K_d has some level of negative correlation with solubility. No effect was found at 1.0 - 1.5 m, 4.0 m, and 8.0 m. Organic Carbon/Water Partition Coefficient (K_{oc}) showed high results exceeding the log K_{oc} criteria of 4.5; as a result, this is now a matter of concern on the potential adverse effects of the substance on terrestrial organisms within its vicinity. Roots had the highest BAFs PCB concentrations for *Duranta plumieri* and *Lantana camara*. Two-way ANOVA showed that bioaccumulation factors (BAFs) of *Duranta plumieri* (Golden dew drops plant) had significant differences between the leaves, trunks and shoots. BAFs of *Lantana camara* (*Kantutay* grass) had no significance difference. Variations and complexities of PCBs manifest over time. Slow degradation and persistence of PCBs exhibited its physical characteristics and resistance to external factors in the environment. The contamination of PCBs in the environment especially the higher chlorobiphenyls over decades of exposure, and proliferation of PCBs is an important environmental concern that may pose an environmental and health hazards.

Keywords: Aroclor, congener, leaching, polychlorinated biphenyls, vertical partitioning, bioaccumulation factor