Study of the Contamination Levels of some Persistent Organic Pollutants in Soil and Water in Egypt

Thesis Submitted

By

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ABSTRACT

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The contamination levels of PCDD/PCDFs and PCBs in irrigation water are the most rarely studied throughout the world. The major problem in Egypt is the lack of statistics about these contaminants of POPs in irrigation water and soil. Therefore, this study is the first comprehensive report to elucidate the estimation and sources of PCDD/PCDFs and PCBs in Irrigation water and soil from Egypt. A total of 24 irrigated water samples were collected from different irrigation canals which are adjacent to industrial areas from six Egyptian governorates (Bani Swef, El-Giza, El-Sharkeya, El-Menofeya, El-Gharbeya, and Alexandria). The study shows that irrigation water canals were contaminated with low levels of PCDDs/PCDFs, which were 0.95 pgWHO-TEQ/l and the total of PCDD/PCDFs and dl-PCBs were 2.06 pgWHO- TEQ/l with contamination ranging between 0.88 to 2.97 pgWHO-TEQ/l while the levels of indicator PCBs were 18.52 ng/l and ranged between 0.39 to 165.6 ng/l. The most predominant dioxins congeners were HpCDD, OCDD, HpCDF, and OCDF while for dl-PCBs were PCB105 and PCB118, and for ndl-PCBs was PCB138.

At 36 sites of agricultural surface soil, the mean of concentrations of PCCD/Fs was found to be 171.9 pg/g these results below U.S. guideline value (1000pg/g). In dl-PCBs the mean was 3194.9 pg/g and the mean concentration of ndl-PCBs was found 8900 pg/g. OCDD/F and HpCDD/F were the predominant congeners in PCCD/Fs while in PCBs, PCB105 and PCB118 were the dominant congeners, where high chlorinated homologues

Abstract

Were higher concentrations than low chlorinated homologues that related with the solubility, volatility and rate of degradation of congeners.

The major sources for these contaminants in water were fire bricks followed by textile industries closer to the located sampling sites. The detected pattern was found to be similar to the patterns reported in the air by other studies

The stationary phases which emitted of PCDD/Fs and PCBs were the major sources lead to contaminate the surface soil where the pattern of congeners from these sources it's the same profiles from soil. Although the concentrations of the studied POPs are found to be low in irrigated water, it may be considered as a potential source of soil pollution due to their accumulation process in the agricultural land and may lead to risk on human health by consuming the agricultural products from contaminated soil irrigated by contaminated water.

Keywords: PCDD/Fs; dl-PCBs; Indicator PCBs; irrigation water; agricultural soil; Industrials Area and Egypt.