

Determination of selected organochlorine pesticide (OCP) compounds from the Jukskei River catchment area in Gauteng, South Africa

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Abstract

Organochlorine pesticides (OCPs) are continually detected in the environment due to their increasing applications in agriculture and industry. The presence of OCPs in the environment is not desirable since they are well known to have negative impact in humans, animals and birds. Thus, there has been a continual demand to monitor the presence of OCPs within the environment. Liquid-liquid extraction (LLE) and Soxhlet extraction (SE) methods (using dichloromethane as the extracting solvent,) were optimised and evaluated for the determination of these compounds in surface water (unfiltered and filtered) and sediment samples. The crude extracts obtained were subjected to column chromatography for clean-up. Thereafter, 1 μl of the cleaned extracts were injected into the GC equipped with ECD.

Percentage recoveries obtained for OCPs ranged from 98.90 \pm 7.32 (2,4'-DDE) - 124.1 \pm 8.23 endosulfan II (ENDO II) % and from 98.99 \pm 5.30 (2,4'-DDE) - 121.1 \pm 0.38 (4,4'-DDE) % in spiked triply distilled water and sediment samples respectively. The levels of OCPs obtained in unfiltered environmental water samples ranged from 0.631 \pm 0.03 (γ -HCH) - 1 540 \pm 0.19 $\text{ng}\cdot\text{mL}^{-1}$ (4,4'-DDT) while levels in filtered water samples ranged from 0.895 \pm 0.01 (γ -HCH) - 9 089 \pm 0.08 $\text{ng}\cdot\text{mL}^{-1}$ (HEPTA). Levels of analysed OCPs obtained in sediments ranged from 0.266 \pm 0.01 (δ -HCH) - 22 914 \pm 2.85 $\text{ng}\cdot\text{gdw}^{-1}$ (2,4'-DDE). Analytes adsorbed on the sample bottles used for water samples collection gave levels which ranged from 0.01 \pm 0.01 - 1.06 \pm 0.02 $\text{ng}\cdot\text{mL}^{-1}$ for OCPs.

The levels obtained from the catchment were significantly higher than the water criteria values recommended by USEPA and DWAF for the protection of the aquatic environment. Levels obtained were also higher than those of other studies conducted so far in South African aquatic environments. There is, therefore, a definite pollution of the Jukskei River catchment by the OCPs studied.

Keywords: OCPs, surface water, sediments, liquid-liquid extraction, GC-ECD