

NOTE

Quantitative Estimation of Some PCBs in Lake Water By GCMS

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Abstract

Hydrophobic organic chemicals such as chlorinated pesticides, polychlorinated biphenyl and polyaromatic hydrocarbons are transported long distance in the atmosphere and enter surface water via wet and dry deposition. Developing effective strategies to manage toxic compounds requires a quantitative understanding of relationships among pollutant source, sinks and ecosystems effects. The complexity and diversity of environmental contaminants has resulted in the development of many different analytical techniques and protocols for their extraction and analysis. The quantitative estimation of PCBs is possible when analyzed on GCMS.

Key words : PCBs, Lake water, GC + MS.

PCBs are ubiquitous in the environment. These compounds originate from both natural and anthropogenic sources and include suspected and known carcinogens. If released into the environment, PCBs persists for years because they are so resistant to break down by chemical or biological agents (1, 2). For understanding of environmental fate of PCBs, it is necessary to measure the concentration of individual congeners as they greatly differ in toxicity. Congeners may also persist for different length of time in the environment due to fractionation as PCBs move between various environmental compartments. The paper reports the results of a study carried out for determining the concentrations of PCBs in a number of lakes and water sources around Nagpur City. It also summarizes the analytical technique developed and the separation identification of PCBs using GCMS system.

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Telankhedi and Ambazari lake water from Nagpur area was collected in a 5-liter jerry can. The PCBs were extracted from the lake water by liquid-liquid extraction using dichloromethane as solvent; 1000 ml of the water sample was taken in 3 liters separatory funnel and 20 ml of dichloromethane was added and shaken vigorously for 3—4 minutes with periodic

venting. Then it was allowed to stand for 10 minutes so that both the organic and aqueous layer gets well separated. The organic layer was collected. The procedure was repeated thrice. Total extract was passed through a combination of florosil and sodium sulfate

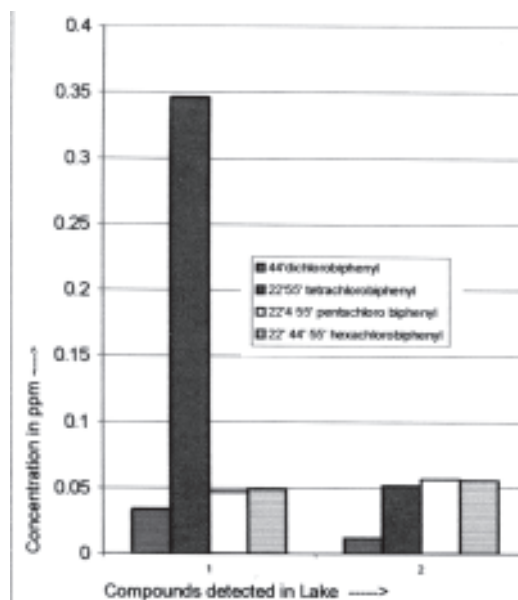


Figure 1. Concentration of PCBs in (1) Ambazari and (2) Telankhedi lake Water.

column to remove the interferences and moisture. After passing through the column, the organic layer was concentrated up to 1 ml by flash evaporator. The samples were then analyzed by GCMS.

Varian saturn 2200 MS with GC 3800CP was used for analysis. Separation was carried out using DB-5. MS column having length 30 m, 0.25 mm ID and 0.25-micron film. Injector temperature was set at 280 C. Oven temperature was programmed from 60C, hold for 2 minutes, heated to 300C at 5C/min. Ion trap heated to 240C and acquisition mass range was from 40—450 Dalton. Other condition were fased on EPA method 525; 0.5 µl sample was injected into the GC and fragmentation pattern was observed.

Quantiative estimation of PCBs is possible when analyzed on GCMS. The exact concentration of PCBs was determined from the calibration curve of individual PCB. A reconstructed total ion chromatogram for a standard individual PCB such as 2, 2', 5, 5'-TCB was considered for quantification. A search with NIST

96 libray confirmed the presence of 2,2', 5, 5'-TCB. Calibration curve for 4 individual PCBs in the range of 0.00 to 1.00 ppm was developed. It was observed that the concentration of PCBs (4,4'-DCB, 2,2',5, 5'-TCB, 2,2',4, 5,5'-PCB, 2,2',4,4',5,5'-HCB) in the Ambazari lake was in the range of 0.008—0.346 ppm. In Telankhedi lake the PCBs (4,4'-DCB, 2,2',5, 5'-TCB, 2,2',4, 5,5'-PCB, 2,2',4,4',5,5'-HCB) concentrations were in the range of 0.007—0.057ppm. The concentrations of these are presented in Figure 1. figure 1 gives the concentration of the identified PCBs in the lakes.

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