Asian Journal of Chemistry Vol. 19, No. 2 (2007), 1562-1564

NOTE

Concentration, Distribution of DDT and Malathion in Soil Water, Plant and Fishes in Rajnandgaon, India

L.K. THETWAR*, P.K. SARWAY†, SANGEETA GUPTA†
M.R. AUGAR¶, R.C. TANDON¶, H.S. DEWANGAN** and N.K. TRIPATHI††
Department of Chemistry, Government College, Kota, Bilaspur-495 001, India

Rajnandgaon is thickly populated district headquarter with various industries encompassing the agricultural lands. Pesticides like DDT and malathion are employed in agricultural rural and urban areas. Industrialization increases the concentration of DDT, malathion, lead and cadmium. These are nonbiodegradable in nature. In most of the samples these have been found to show exceedingly high concentration as compared to the tolerance limit as recommended by WHO/FAO.

Key Words: DDT, Malathion, Soil water, Rajnandgaon.

Indiscriminate use of pesticide has contaminated our environment. Heavy industrialization and increasing population producing industrial waste and domestic sewage and sludges collectively increased the concentration of DDT, malathion, cadmium and lead in the environmnet. The present work presents a model to estimate the collective influence of toxic compounds (DDT and malathion) and toxic elements like cadmium and lead[1-4]. Physico-chemical parameters of Sheonath river is given in Table-1.

DDT, malathion, *n*-hexane and acetone obtained were of analar grade. The glasswares used for collection of samples and analytical work were washed with warm detergent solution, tap water, doubly distilled water and finally with acetone.

The sampling stations located in Rajnandgaon city are densely populated and ground water level is very low. Seepage of surface water with pesticides and cadmium and lead have been shown to be high.

Sampling water (1 L) from river, surface, ground and tank water collected in polythene bottles previously soaked with 8 N nitric acid and then cleaned with detergent followed by rinsing with doubly distilled

†Government Model P.G. Science College, Bilaspur, India.
¶Department of Chemistry, Government P.G. Commerce, Arts and Science College, Bilaspur, India.
**Department of Chemistry, Rahod College, Rahod, Bilaspur, India.
††Department of Chemistry, CMD P.G. College, Bilaspur, India.

water. The samples were acidified with 6 N nitric acid (8 mL/L) soon after sampling. Fresh fruits and vegitables (20 g) were cleansed with tap and doubly distilled water, 5 g of soil samples from surface soil were collected from each sampling station.

TABLE-1
PHYSICO-CHEMICAL CHARACTERISTICS OF RIVER SHEONATH AT DIFFERENT SAMPLING LOCATIONS (mg/L)

Sample station	Season	pH	Conductivity (ms/cm)	Total dissolved solid	Total hardness	Cl^-	SO_4^{2-}	NO_3^-
Reference point 1 km upstream of different meeting the river	Summer	7.5	260	155	90	15	10	1.5
	Monsoon	8.0	228	175	80	10	7	1.3
	Winter	8.0	215	120	100	12	9	1.2
Outfill point	Summer	7.2	625	275	150	100	25	1.2
	Monsoon	7.9	238	156	90	50	18	1.3
	Winter	8.0	225	135	100	20	15	1.4
2 km down stream of reference point	Summer	7.8	290	170	100	15	15	0.75
	Monsoon	8.2	205	130	80	07	10	0.55
	Winter	8.2	220	110	90	10	10	0.30

Sample preservation: Toxic substances and toxic metals are present in low concentrations and are subject to a variety of chemical modifications after sampling. Preservation aims at maintaining original concentration of the analytes, their chemical nature and biodgradation, hydrolysis, precipitation, co-precipitation and other physico chemical reactions. Organics are generally preserved[2,5] with cooling at 4ºC.

Sample preparation: The samples of grains and vegetables were reduced to a suitable size by quartering and grinding. Grinded samples were wet digested with $HNO_3 + HClO_4$ mixture.

Procedure: The pesticides were extracted from water samples to 100 mL of *n*-hexane in 5 steps using separating funnel. Clean extract was concentrated over a rotary evaporator and nitrogen flushes and finally made upto 1 mL of volume each for DDT and malathion in *n*-hexane. The standard DDT and malathion solution and sample extracts were applied on GLC (Nucon 5767).

Conditions for GLC: (1) Column - 6´ × 1.8´´ glass column filled with 80-100 mesh gas chrome coated with mixture of 1.5 % OV-17 and 1.95 OV-210 at Temperature 190ºC, (2) Detector - Ni63 ECD, (3) Injector temperature - 250ºC and (4) Carrier gas - nitrogen with flow rate 50 mL/min.

The level of detector and level of quantitation were in the range 0.15-1.8 and 0.15 to 2 for DDT and malathion, respectively.

Cadmium and lead were concentrated by complexation and extraction methods. The organic extracts were atomized for cadmium and lead and responses recorded[6]. The results are presented in Table-2.

TABLE-2
CONCENTRATIONS OF DDT AND MALATHION AND TOXIC ELEMENTS CADMIUM AND LEAD AT RIVER AND TANKS

	DDT (ppm)	Malathion (ppm)	Cadmium (ppm)	Lead (ppm)
Sampling stations (U)	1.35	1.70	2.20	30.00
Sheonath river (D)	1.75	2.00	3.50	40.00
Tank-I (Railway station)	1.75	2.00	0.28	7.50
Tank-II	1.55	1.75	0.29	7.25
Tank-III	1.00	1.25	0.32	6.50
Hand pump -I (Railway station)	1.27	1.90	0.25	8.50
Hand pump-II	1.25	1.55	0.28	8.00
Hand pump-III	1.30	1.39	0.31	7.50
Soil, sample no. (Railway station)				
(1)	1.25	2.50	1.75	26.00
(2)	1.75	1.55	1.65	25.00
(3)	1.35	1.25	1.55	25.00
In fruits and vegetables				
Beet	0.49 - 0.53	1.15 - 1.20	-	
Cucumber	0.90 - 1.20	1.10 - 1.50	0.19	0.80
Litchi	0.80 - 1.25		8.56	0.69
Sapota	1.10 - 2.52			
In fishes in tanks				
C. fasciatus	1.25 - 1.30	1.5 - 2.00	0.25	18.00
M. vitatus	0.80 - 1.00	1.45 - 1.55	7.20	15.00

A perusal of the data (Table-2) indicates higher concentration of DDT and malathion in the down stream of river, thickly populated location shows higher percentage of DDT and malathion in soil, water fruits and fishes. The widespread use of universally persistent pesticides like DDT and malathion in the agricultural field and gardens are responsible for higher concentration of these hazardous pesticides[7]. Lead and cadmium concentrations have also been found to increase in highly populated areas.

REFERENCES

1. R. Kumar, N. Pant and S.P. Shrivastava, *Intr. J. Androl.*, **23**, 145 (2000).
2. P. Khare, D.K. Patel, R. Kumar and S.P. Shrivastava, *Res. J. Chem. Environ.*, **7**, 39 (2003).
3. L.S. Hoo, A. Samat and M.R. Othman, *Res. J. Chem. Environ.*, **7**, 60 (2003).
4. R.J. Krupadam and R. Sarin, *Res. J. Chem. Environ.*, **7**, 85 (2003).
5. P.K. Pandey, S. Yadava, S. Nair and M. Pandey, *Curr. Sci. (India)*, **86**, 1426 (2004).
6. M. Abdullah, S. Vohra and M. Athar, Trace and Toxic Elements in Nutrition and Health, Wiley Eastern Ltd., New Delhi, pp. 305-311 (1993).
7. G.S. Toteja, Methods of Analysis for Adulterants and Contaminants in Food, Indian Council of Medicial Research, New Delhi (1990).

(*Received*: 16 August 2005; *Accepted*: 20 September 2006) AJC-5129