International Journal of Pharmacy and Biological Sciences
ISSN: 2321-3272 (Print), ISSN: 2230-7605 (Online)
IJPBS™ | Volume 8 | Issue 4 | OCT-DEC | 2018 | 851-853
Research Article | Biological Sciences | Open Access | MCI Approved| ज्ञान-विज्ञान विमुक्तये
|UGC Approved Journal |

ASSESSMENT OF HEAVY METAL DISTRIBUTION IN DIFFERENT SEASONS AT AGNIAR ESTUARY, TAMIL NADU, INDIA

R. Saraswathi and P. Sumithra*

P.G. & Research Department of Microbiology, Srimad Andavan Arts and Science College, Tiruchirappalli - 620 005, Tamil Nadu, India

***Corresponding Author Email: drsiva17@gmail.com**

ABSTRACT

Today aquatic pollution is a serious and emerging problem in almost of all the countries throughout the globe. The increasing effect of heavy metals has an increasing effect on aquatic as well as terrestrial organisms. Hence, monitoring of heavy metals is the need of the hour and so the presence study was aimed at assessing commonly occurring heavy metals in water for the four seasons of the year in Agniar estuary. The order of heavy metals in terms of increasing concentration was Ar > Pb > Cd > Cr > Cu > Zn > Fe > Mn. A perusal of the levels of heavy metals obtained in the present study with those of the CPCB (India) reveals that the metals like Fe, Zn, Cu and Mn recorded safe levels while that of Cr, Cd, Pb and Ar were on the higher side. Among the four seasons minimum levels were recorded during the pre-summer and maximum levels during the raining seasons.

KEY WORDS

Heavy metals, water, estuary, Tamil Nadu.

INTRODUCTION

Today aquatic pollution is a serious and emerging problem in almost all the countries throughout the globe. Even though a trace amount of heavy metals is always present in water from terrigenous sources from weathering of rocks which may be cycled through chemical and biological contaminates today (Hari Kumar and Jisha, 2010; Sekabira *et al.*, 2010; Muwanga, 1979) because of anthropogenic activities caused by man the amount of pollution has drastically increased in water. Among the various pollutants, contamination of heavy metals in the aquatic system has attracted global attention due to its abundance, persistence and environmental toxicity (Ahmed *et al*., 2015; Islam *et al*., 2015). The increasing effect of pollution of heavy metals have a significant adverse effect on all aquatic organisms including humans (Mohammad Ali *et al*., 2016; Yi *et al*., 2011). During transportation of heavy metals in the riverine system, it may undergo frequent changes due to dissolution, precipitation and sorption (Abdel-Ghani *et al.*, 2007; Anahid *et al.*, 2011). According to many workers (Ali *et al*., 2016; Saleem *et al.,* 2015; Zhang and Liu, 2008) investigation of heavy metals in water and sediment can be used to assess the anthropogenic and industrial impacts and risks posed by waste discharges into reverie systems. Hence, it is imperative to collect information on the concentration of heavy metals in aquatic systems, the present study was attempted in the Agniar estuary situated in Pudukkottai District, Tamil Nadu.

MATERIAL AND METHODS

In the present study, the water samples were collected from the Agniar estuary, which is located at Pudukkottai District in the State of Tamil Nadu. Water samples were drawn from the surface of the estuary and stored in separate sterile containers for laboratory analysis. Further, the heavy metals like Iron, Zinc, Copper, Chromium, Cadmium, Cobalt, Lead, Arsenic and Manganese in the water samples were also analyzed.

Using an atomic absorption spectrophotometer (GBC Model 902) at Biotechnology Lab, Tiruchirappalli. The data were analysed every month and in averaged seasonally. The water samples for heavy metals were prepared according to Maina *et al*. (1984) and APHA (1998).

RESULTS

The heavy metal concentration estimated in the water for the four different seasons of the year are presented in Table-1. Among the nine heavy metals that were estimated, the pre-summer recorded levels ranging from 0.002 to 34 mg/l, while the lowest concentration was recorded by Manganese. During the summer season the heavy metals levels were again found to range from 0.002 to 42 mg/l. However here also the lowest level was recorded by Arsenic and the highest level by Manganese. A perusal of the post-summer and raining season also recorded the same pattern. However, the concentration of both arsenic and manganese had shown a progressive increase.

Table-1: Heavy metals load in Agniar Estuary (mg/l)

S. No.	Heavy metals	Pre-summer (Jan.-Mar.)	Summer (Apr.-Jun.)	Post-summer (Jul.-Sep.)	Rainy/Winter (Oct.-Dec.)
1.	Iron (Fe)	12.20 ± 0.46	16.40 ± 0.56	14.30 ± 0.28	19.50 ± 0.44
2.	Zinc (Zn)	6.50 ± 0.52	7.20 ± 0.62	5.60 ± 0.42	7.80 ± 0.32
3.	Copper (Cu)	6.20 ± 0.62	5.80 ± 0.40	4.20 ± 0.62	8.90 ± 0.52
4.	Chromium (Cr)	0.67 ± 0.26	0.76 ± 0.42	0.79 ± 0.84	0.98 ± 0.54
5.	Cadmin (Cd)	0.09 ± 0.42	0.14 ± 0.72	0.18 ± 0.40	0.24 ± 0.46
6.	Cobalt (Co)	0.007 ± 0.64	0.009 ± 0.72	0.009 ± 0.64	0.023 ± 0.56
7.	Lead (Pb)	0.04 ± 0.32	0.06 ± 0.54	0.07 ± 0.34	0.12 ± 0.40
8.	Arsonic (Ar)	0.002 ± 0.54	0.002 ± 0.32	0.003 ± 0.32	0.004 ± 0.34
9.	Manganese (Mn)	34.00 ± 0.74	42.00 ± 0.28	48.00 ± 0.72	52.00 ± 0.76

An individual comparison of metals on a season wise basis reveals that all the metals analyzed except for zinc and copper showed a progressive increase in water content from the pre-summer season to the rainy/winter season. However, zinc and copper recorded minimal levels post-summer season and maximum levels during the rainy seasons. Thus, it appears that in general, the minimal levels occur during the pre-summer season and maximum levels in the rainy season. Nevertheless, classifying the metals in an increasing order for all the four seasons recorded the same sequence, i.e., Ar> Pb>Cd> Cr>Cu>Zn>Fe>Mn.

A perusal of literature regarding the Indian Pollution Control Board for water specifications reveals that the levels of heavy metals like Fe, Zn, Cu and Mn was on the safer side while the levels of heavy metals like Cr, Cd, Pb, Ar were on the higher side. The present study clearly reveals that the water is contaminated probably due to consequence of industrial and agricultural activities, leaching from rocks and soil and atmospheric deposition and other human activities (Manoj Kumar and Puri, 2015). Nevertheless, the presence of these metals in water clearly indicated the need to closely monitor these water bodies as they have been shown to cause innumerable diseases to organisms including man.

REFERENCES

Abdel-Ghani, N. T., Hefny, M. and El-Chaghaby, G. A. F. (2007). Removal of lead from aqueous solution using low cost abundantly available absorbance. *Int. J. Environ. Sci. Technol.*, 4: 67-74.

Ahmed, M. K., Baki, M. A., Islam, M. S., Kundu, G. K., Sarkar, S. and Hossain, K. M. M. (2015). Human health risk assessment of heavy metals in tropical fish and shell fish collected from the river Buriganga, Bangladesh. *Environ. Sci. Pollut. Res*. 10: 1007.

Anahid, S., Yaghmaei, S. and Ghobadinejad, Z. (2011). Heavy metals tolerance of fungi. *Scientia Iranica*, 18: 502-508.

Mohammad Ali, M., Mohammad Lokman Ali, Md. Saiful Islam and Md. Zillur Rahman (2016). Preliminary assessment of heavy metals in water and sediment of Karnaphuli River, Bangladesh. *Environmental Nanotechnology, Monitoring and Management*, 5: 27-35.

APHA (1998). Standard Methods for the Examination of Water and Waste Water. American Public Health Association, New York. 20th ed.

Hari Kumar, P. S. and Jisha, T. S. (2010). Distribution pattern of trace metal pollutants in the sediments of an urban wetland in the southwest coast of India. *Int. J. Eng. Sci. Technol.*, 2: 840-850.

Islam, M. S., Ahmed, M. K., Raknuzzaman, M., Habibullah-Al-Mamum and Masunaga, S. (2015). Assessment of trace metals in fish species of urban rivers in Bangaladesh. *Arch. Environ. Contam. Toxicol.*, 68: 92-106.

Maina, D. M. (1984). Heavy metals analysis of sewage sludge by X-ray fluorescence technique and the environmental implications. University of Nairobi, Kenya.

Manoj Kumar and Puri, A. (2015). A review of permissible limits of drinking water. *Indian Journal of Occupational & Environmental Medicine*. 16: 40-44.

Muwanga, A. (1979). Environmental impacts of copper mining at Kilembe, Uganda: A geochemical investigation of heavy metals pollution of drainage waters, stream, sediments and soils in the Kilembe valley in relation to mine waste disposal. Ph.D. dissertation, University of Braunschweig, Germany.

Received:04.08.18, Accepted: 07.09.18, Published:01.10.2018

Saleem, M., Iqbal, J. and Shah, M. H. (2015). Geochemical speciation, anthropogenic contamination, risk assessment and source identification of selected metals in fresh water sediments - a case study from Mangla lake, Pakistan. *Environ. Nanotechnol. Monit. Manag.*, 4: 27-36.

Sekabira, K., Origa, H. O., Basamba, T. A., Mutumba, G. and Kakulidi, E. (2010). Assessment of heavy metal pollution in the urban stream sediments and its tributaries. *Int. J. Sci. Technol.*, 7: 435-446.

Yi, Y., Yang, Z. and Zhang, S. (2011). Ecological risk assessment of heavy metals in sediment and human health risk assessment of heavy metals in fishes in the middle and lower reaches of the Yangtze river basin. *Environ. Pollut.*, 159: 2575-2585.

Zhang, J. and Liu, C. L. (2008). Riverine composition and estuarine geochemistry of particulate metals in China – weathering features, anthropogenic impact and chemical fluxes. *Estuar. Coast Shelf Sci.*, 54: 1051-1070.

***Corresponding Author:**
P. Sumithra*
Email: drsiva17@gmail.com