



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

International Journal of Recent Scientific Research
Vol. 7, Issue, 8, pp. 13160-13163, August, 2016

**International Journal of
Recent Scientific
Research**

Research Article

ANALYSIS OF HEAVY METAL CONCENTRATIONS IN BHAVANI RIVER WATER

Rabeeth^{1*} and Ranganayaki P²

Zoology, Ckikkanna Govt. Arts College, Tirupur – 641602

ARTICLE INFO

Article History:

Received 05th May, 2016

Received in revised form 08th June, 2016

Accepted 10th July, 2016

Published online 28st August, 2016

Key Words:

Bhavani River, Heavy metal concentration,
Surface water

ABSTRACT

Heavy metals are natural constituents of the fresh water environment. Apart from nature sources, anthropogenic sources of heavy metals includes emissions from industries, untreated urban sewages, pesticides and fertilizers, atmospheric deposition in fresh water environment. Economic growths have affected the rivers in different ways and rivers have received increasingly large discharges of industrial effluents, fertilizers and pesticides from agricultural practices and domestic wastes. The concentrations of trace metals such as cadmium, chromium, copper, iron, lead, manganese were determined in Bhavani river in different locations from Sirumugai to Kalingarayanpalayam using Atomic absorption Spectrophotometer. These pollutants affect the aquatic environment and fishes. Fishes are used as bio-indicators playing an important role in monitoring heavy metals pollution. The pollution status and heavy metal contaminants level varies in water with reference to different locations and in seasonal variations.

Copyright © Rabeeth and Ranganayaki P., 2016, this is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Modern technology progresses the natural environment suffers from the determined effects of pollution. In aquatic ecosystem, heavy metals are considered as the most important pollutants. The metal contamination in aquatic ecosystem is yet considered to be unsafe not only for the human beings, but also for the wild organisms. The present review considers the special emphasis on the heavy metal pollution status in river. Bhavani river having many dangerous chemical elements, it releases into the environment accumulate in the soil and surface of the water bodies.

Metals are inherent component of the environment that poses a potential hazard to human being and animals. Fresh water sources like rivers are the major resources and aquatic inhabitant of fishes, due to which fishes are heavily exposed to pollution. Fishes in comparison with other water living organisms are more sensitive to many toxicants and are a convenient test subject for indication of ecosystem. In addition, Fishes are located at the end of the aquatic food chain and may accumulate metals and pass them to human beings through food thus causing chronic or acute diseases.

The objective of the present study is to briefly describe the level of heavy metals Bhavani river water. The heavy metals like Cadmium (Cd), Chromium (Cr), Copper (Cu), Iron (Fe), Lead (Pb) and Magnesium (Mg) concentrations are studied in Bhavani river at six different locations and it is observed from the month of June 2015.

Study Area

The Bhavani River is one of the tributaries of Cauvery River in its mid-reach whose sub-basin lies between latitudes 10°56'03" N and 11°46'14" N and Longitudes 76°24'41" E and 77°41'11" E. The Bhavani River rises at an altitude of about 2,634 in the Billimala range of Nilgiri hills in Tamilnadu. It is the major resource of water supply in Erode district and the second largest river in Tamilnadu. It arises in the states of Kerala and flows through various places in Tamilnadu. This river is also affected and got pollution by various factories and industries and the impact of bleaching and dyeing effluents was noted in surface water quality in terms of Physics ore. The river Bhavani, Cauvery and Amirthanadhi are mingled together in one place at Bhavani and it is also named as "Kooduthurai". The Kooduthurai is also called as "Moorkudal".

The famous temple which is called as Sangameswarar temple is located in the same place. Bhavani river covered almost all over the industrial region. So, water samples are taken from six different locations of the river for analysis of heavy metal concentration.

MATERIALS AND METHODS: SAMPLING SITES

The present study, the area in Bhavani River is selected. The selected areas were categorized into six locations. Overall six sampling sites samples were collected for analysis. The description of station is given below and locations are given in figure 1:

*Corresponding author: Rabeeth

Zoology, Ckikkanna Govt. Arts College, Tirupur – 641602

Station 1 is located in Sirumugai
 Station 2 is located in Sathyamangalam
 Station 3 is located in Kodiveri
 Station 4 is located in Athani
 Station 5 is located in Perunthaliyur
 Station 6 is the end of the Bhavani River (Kalingarayanpalayam)

Method of Sampling

Collected samples were preserved in pre-cleaned plastic bottles prior to analysis from the above mentioned sites. Cadmium (Cd), Chromium (Cr), Iron (Fe), Lead (Pb) and Magnesium (Mg) concentrations were determined using Atomic Absorption Spectrophotometer (AAS) after appropriate treatment and digestion.

Collections of Samples

The samples were collected from the surface water and kept in sterilized plastic bottles with the addition of 2ml concentrated HNO₃ in order to preserve the metals and also to avoid precipitation and transported to laboratory immediately for further analysis. The analysis for the heavy metals was done using atomic absorption Spectrophotometer.

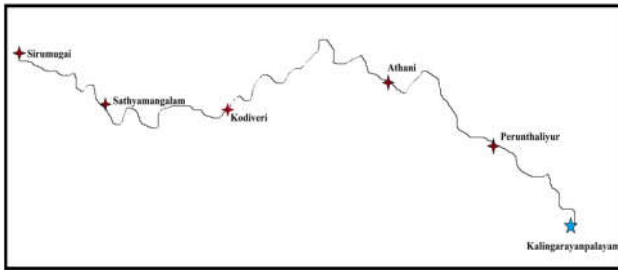


Figure 1 Map of Collected Samples

RESULTS

All the surface water samples collected from the different effluent exposed sites of the river Bhavani were analyzed for Cd, Cr, Cu, Pb, Fe, Mg. Metal concentration in river water is illustrated in Table 1. It is observed that the maximum cadmium value is 0.1 ppm, chromium value is 0.2 ppm, Fe value is 0.01 ppm, Pb value is 0.2 ppm, and Cu values are 0.01 ppm. The magnesium values are vary in the six locations such as location: 1) 9.2, location 2) 12.16, location 3) 11.18, location 4) 15, location 5) 27, and location 6)32. In urban areas variation due to various large and small industries are concentrated in these areas. As the effluents from industries are directed in to the river, most of the dissolved heavy metals showed slightly high concentrations during the summer periods than that of the winter sessions.

The results of Heavy Metals concentration analysis are summarized in following table 1.

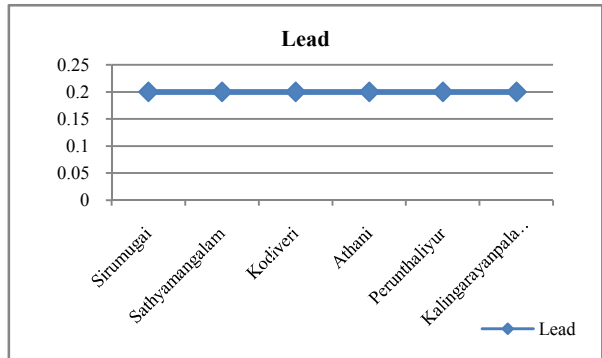
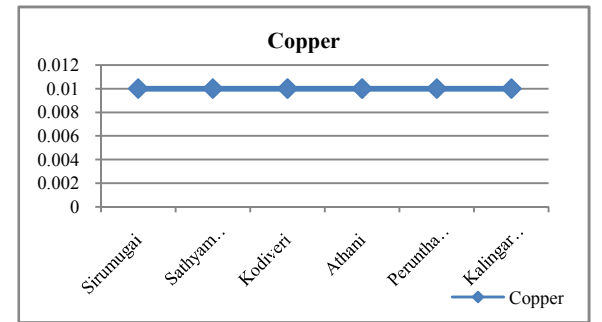
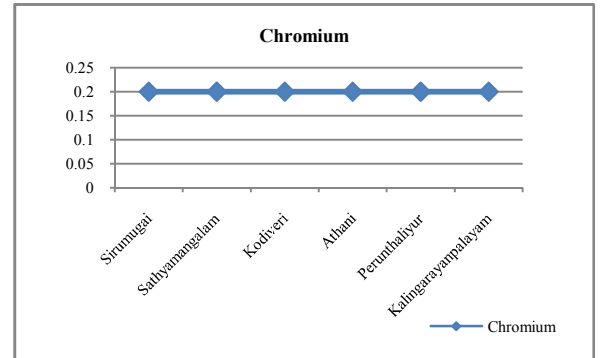
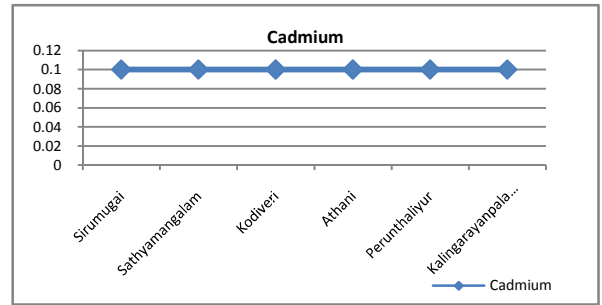


Table 1 Heavy Metal Concentrations in Water in various sampling stations

S.No	Location	Cd (ppm)	Cr (ppm)	Cu (ppm)	Pb (ppm)	Fe (ppm)	Mg (ppm)
1	Sirumugai	0.1	0.2	0.01	0.2	0.01	9.2
2	Sathyamangalam	0.1	0.2	0.01	0.2	0.01	12.16
3	Kodiveri	0.1	0.2	0.01	0.2	0.01	11.18
4	Athani	0.1	0.2	0.01	0.2	0.01	15
5	Perunthaliyur	0.1	0.2	0.01	0.2	0.01	27
6	Kalingarayanpalayam	0.1	0.2	0.01	0.2	0.01	32

Table 2 List of Standards

S.No	Organizations	Cd	Cr	Cu	Pb	Fe	Mg
1	WHO	0.003 Mg/L	0.05 (p)	2	0.01 Mg/L	No guide lines	0.5 Mg/L
2	BIS (µg/L)	-	50	50	10	300	-

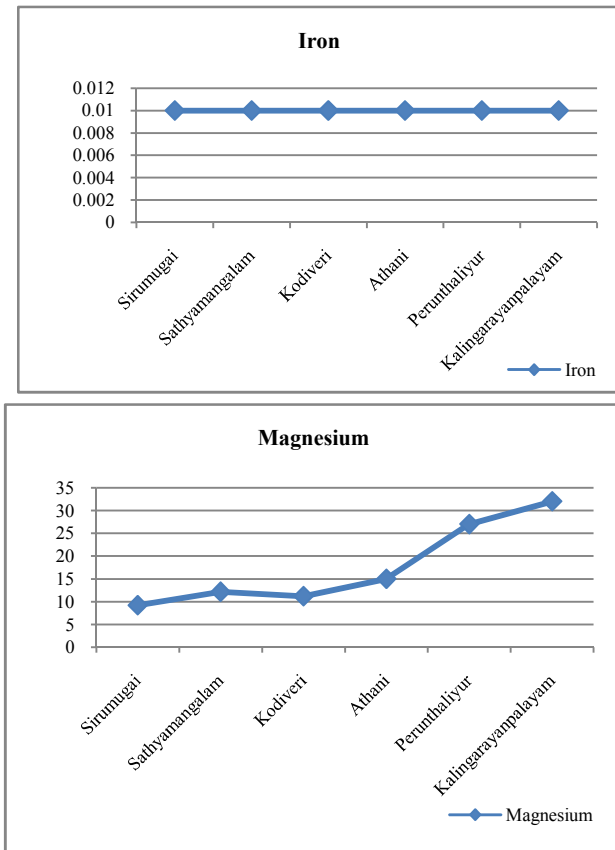


Figure 2 Heavy metal Concentrations in Bhavani River water mg/l
a) Cadmium b) Chromium c) Copper d) Lead e) Iron f) Magnesium

The mean concentration of the metals were observed in the order $Mg > Cr > Cd > Fe$ ($9.2 > 0.2 > 0.1 > 0.01$). From the above results that the Mg values are found to be varying from 9.2 mg/l to 32 mg/l in the river course taken for study. This pollution may be come through industries or from drainage lines which are connected with the river Bhavani.

DISCUSSION

The probable sources of heavy metals in Bhavani river may be caused by the various industries outlets which drains to the river and also affects the human health through the edible fish which is consumed as food. However the results vary on the basis of the seasons. The study of this research will supply valuable information on the level of Heavy Metal contamination in Bhavani River.

Recent report indicates that India is expected to face critical levels of water stress by 2025 and there will be a serious issue. For this reason, great efforts and co-operation between different authorities are needed to protect the Bhavani River from pollution and reduce environmental risks. This can be achieved by the treatment of agricultural, industrial and sewage discharge, regular approaches have to be taken from natural sources and anthropogenic activities are continuously released into aquatic systems causing serious effects of their toxicity, long persistence, bio-magnification and bio-accumulation in the food chain. A study increase in the water temperature was noticed in the river Bhavani.

This may be due to mixing of the effluent from the factories situated in the banks of the river Bhavani. Guidelines for the presence of heavy metals in river water have been set

differently from many international organizations such as, World Health Organization (WHO), European Union Commission (EUC). Other organizations like Bureau of Indian Standards (BIS) have also set that own river water standards.

As specified by these organizations, there are maximum admissible limits for heavy metals in the river water. Therefore effective pollution control measures are a must to save natural water resources from further deterioration. Further work with toxicity testing methods directly on fish both in laboratory and in its corresponding natural setting will be very useful in assessing possible ecological risks of heavy metals.

CONCLUSION

The results indicate that the heavy metal concentration is remarkably high in Bhavani river water now when compared to the results evaluated in 2011. Present evaluation emphasis that special attention must be given to the issue of releasing metals into the river water. Therefore, constant monitoring of the Bhavani river water quality is needed and must be recorded. The alteration in the concentration, mitigating outbreak of health disorders and detrimental impacts on the aquatic ecosystem is to be analyzed. The Evaluation shows that the concentrations of the heavy metals (Cr, Cd, Fe, Pb and Mg) in samples are higher than the MAL by WHO 2008.

This is an indication of pollution hazards and treatment practices in these areas which in turn have implications on the health of the people through the fish. Few samples evidenced the significant metal concentration in water samples in the middle of the river catchment during summer season. It is attributed to the concentration of various textiles and associated industries along with the river course. It is due to presence of through slow rate of river water. Fishes are considered as one of the most Bio-indicators in fresh water ecosystem for the estimation of trace metal pollution. This work can further be extended to test the presence of the heavy metal concentration in Bhavani river water on fish gills and muscles.

Reference

1. Rao, K.L., (1979), "India's Water Wealth Its Assessment, Uses and Projections", Orient Longman, New Delhi, pp.39-70.
2. Central Pollution Control Board, 2003, "Water Quality in India Status and Trend" (1990-2001), New Delhi, MINARS/20/2001-2002, pp
3. Central Board for the Prevention and Control of Water Pollution, 1979, "Scheme for Zoning and Classification of India Rivers, Estuaries and Costal Waters" (Part One: Sweet Water) New Delhi, ADSORBS/3/1978-79, pp1-19
4. Central Pollution Control Board, New Delhi, "Water Quality Status of River Yamuna", ADSORBS/32/1999-2000, pp.4-22,35-40
5. Canh and Ath.G, APHA (1985), "Standard Methods for the Examination of Water and Waste Water", 16th Edn. Washington, D.C, Environmental Pollution, 121(1):pp.129-136, 2003
6. Heath A.G, (1987), "Water Pollution and Fish Physiology", CRS Press, Florida, USA, pp.245

7. Mena.E, "M et al and their compound in the Environment Occurrence Analysis and Biological relevance", Verlag Chemical, New York, 1991
8. Abida Begum, Ramaiah.M, Harikrishna, Irfanulla Khan and Veenak, "Heavy Metal Pollution and Chemical Profile of Cauvery River Water", E-Journal of Chemistry 2009, 6(1) 47-52
9. Lokhande R.S and Kelkar N, "Studies on Heavy Metals in Water of Vasai Creek, Maharashtra", *Indian J. Environ. Protect*, 1999, 19,664-668
10. Ahmad M.K, Islam S, Rahman S, Haque M.R and Islam M.M, "Heavy Metals in Water, Sediment and some Fishes of Buriganga River, Bangladesh", *Int. J. Environ. Res*, 4(2):321-332, 2010
11. Singh R.K and Agrawal M, "Atmospheric Deposition Around a Heavily Industrialized Area in a Seasonally Dry Tropical Environment of India", *Environ. Pol*, 138:142-152, 2005
12. Venugopal T, Giridharan L, Jayaprakash M and Velmuragan P.M, "A Comprehensive Geochemical Evaluation of the Water Quality of River Adyar", *India, Bull, Environ, Contam. Toxicol*, 82(2): 211-217, 2009
13. Kar D, Sur P, Mandai S.K, Saha T and Kole R.K, "Assessment of Heavy Metal Pollution in Surface Water", *Int. J. Environ. Sci. Tech*, 5(1):119-124, 2008
14. Lakdawala M.M and Oza B.N, "Removal of BOD Contributing Components from Sugar Industry Waste Water Using Bagasse flyash-Waste Material of Sugar Industry Der Chemica Sinica 2(4):244-251, 2011
15. Macan T.T, "Fresh Water Ecology", 2nd Edn, Longman Group Limited, London, pp. 346, 1978

How to cite this article:

Rabeeth and Ranganayaki P.2016, Analysis of Heavy Metal Concentrations in Bhavani River Water. *Int J Recent Sci Res*. 7(8), pp. 13160-13163.