Poll Res. 39 (2) : 421-423 (2020)

ISSN 0257–8050

STUDY ON DETERMINATION AND ACCUMULATION OF HEAVY METALS IN MULA-MUTHA RIVER, PUNE DISTRICT, (MAHARASHTRA)

DNYANDEO GORAKHE[1] AND NAVNATH CHANDANSHIVE*

[1]Prof. Ramakrishna More College, University of Pune, Pune, M.S., India
**Fergusson College, University of Pune, Pune, India*

(Received 28 January, 2020; accepted 10 March, 2020)

ABSTRACT

Pune city is covered by the Mula-Mutha River which originates in the Western Ghats. This River flows from Khadakwasla Dam towards Pune city covering a distance of 14 km. Due to increasing urbanization, industrialization and poor treatment of utilized water, the status of river water is severely damaged. As good quality water is basic need of mankind, it is necessary to treat the river water. But before that it is a requirement to determine the level of heavy metal contaminants. In the present study the content of Cadmium (Cd), Cobalt (Co), Copper (Cu), Chromium (Cr), Iron (Fe), Nickel (Ni), Lead (Pb), Zinc (Zn) was studied at 5 different locations was studied using Atomic Absoption spectrophotometry.

KEY WORDS : Mula-Mutha River, Pune, Heavy Metals, Industrialization

INTRODUCTION

The current study focuses on the river Mula-Mutha covering the Pune city. Contamination of the environment directly affects water quality. Impurities from surface runoff, sewage discharge and industrial effluents accumulate in rivers and carried to the reservoirs that supply drinking water. These pollutants contains heavy metals which if present in high amounts in water can cause serious problems to aquatic life and humans. Humans who consumes significant amount of fish contaminated with toxic heavy metals it may be risky indicate that some heavy metals are concentrating at different level in the sample fish.

The aim of present study is to determine and assess the levels of heavy metals in Mula-Mutha River in Pune City. For this purpose, a total of 5 water samples from different locations in Pune city were collected for the assessment of the heavy metal concentration during Pre-monsoon and Post-monsoon in 2015. Atomic absorption spectroscopy was used as characterization technique (APHA, 1989).

MATERIALS AND METHODS

Area of study

For this study the area is confined to stretch of Rivers Mula, Mutha and Pawana. Mula River receives heavy loads of agricultural run-off through non-point sources. Mutha River since it passes through the city of Pune receives heavy loads of domestic sewage which is organic and it is a waste of biochemical oxygen demand. Pawana River is the one which is more concerned with industrial effluents from small and large scale industries. Besides that, receives large amount of domestic sewage from municipality sewers and slum areas.

From all the three rivers, sampling stations were selected to give a reasonable comparison of Rivers quality in Pune and its suburbs. For the present study five sampling areas have been considered. These are as follows:

A1- Khadakwasla
A2- Vithalwadi
A3- Sangam Bridge
A4- Bundgarden Bridge
A5- Aundh Bridge

Sampling of water and metal analysis

The pre-monsoon and post-monsoon water samples were collected in 2015. The samples were of composite water sample and collected into pre-acidic, washed polypropylene bottle and kept in polystyrene boxes with ice till they were taken up to the laboratory. The samples were acidified to pH 1-2 with concentrated nitric acid. Water samples were filtered with Whatman Paper 1 and kept in a refrigerator at 4 °C. Concentration of Pb, Cd, Cr, Cu, Zn, Ni, Co, Fe and Mn in the acidified filtrate of water sample determined using atomic absorption spectrometry (AAS: LabIndia AA7000).

Table 1. Sample collection areas

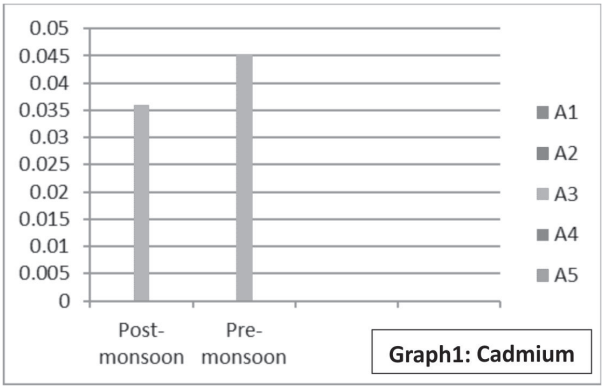
Sample	Name of the area
A1	Khadakwasla
A2	Vithalwadi
A3	Sangam Bridge
A4	Bundgarden Bridge
A5	Aundh Bridge

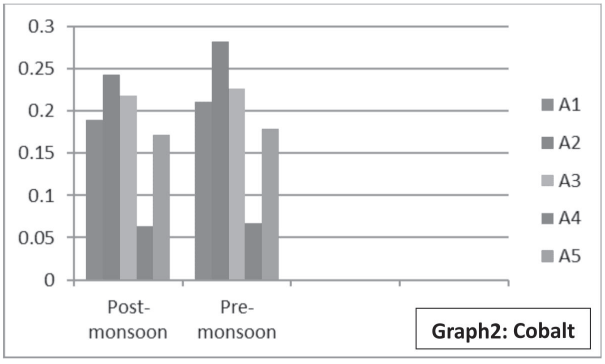
RESULTS AND DISCUSSION

The values of heavy metal contents in the River Mula-Mutha are given in Table 2. The concentrations of different heavy metals at five different areas are shown in graph 1 to 9. It has observed that the concentration of Co,Cu,Cr and Pb were in excess as compared to the permissible limit declared by World Health Organization (WHO,1983). However, the Zn and Mn concentrations in water samples were less or almost equal to the permissible level.

Cd is detectable only in water sample of one area, i.e. A3 (Sangamwadi Bridge) and were in excess as compared to the WHO permissible limit. Ni is detected in two water samples at A3 (Sangamwadi Bridge) where it is present in excess concentration and A4 (Bundgarden Bridge) where it is found in allowable limits given by WHO.

There is no guidance is given by WHO for the concentration of Fe in water. In the present study Fe concentration ranges from 1.57 mg/L to 11.49 mg/L. Consumption of water which has higher level of iron can cause many detrimental effects.

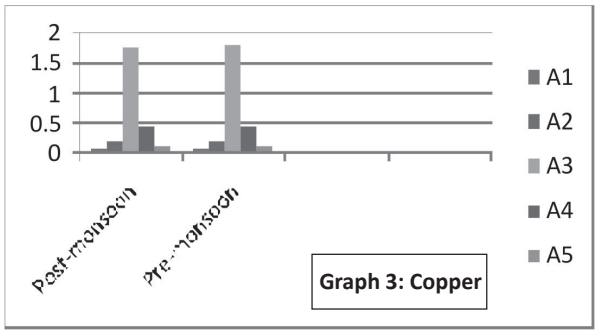


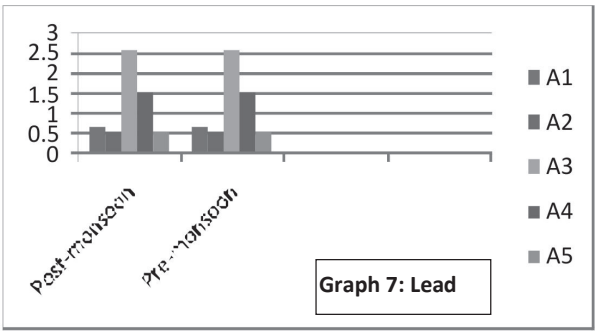


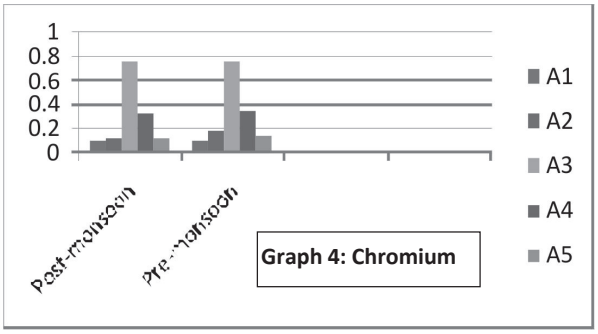
From the observation table and graphs for different metals at different areas, it can be seen that concentrations during pre-monsoon season were more than the concentrations during post-monsoon. It can be hypothesized that decrease in level of

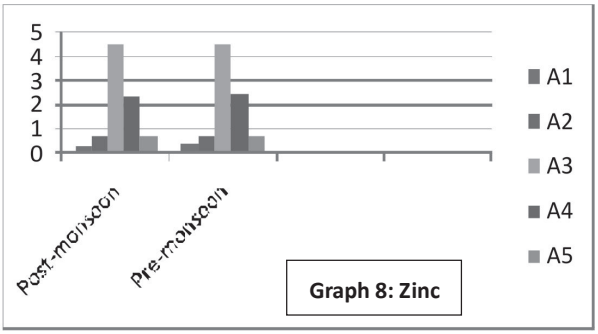
Table 2. Concentration of heavy metals

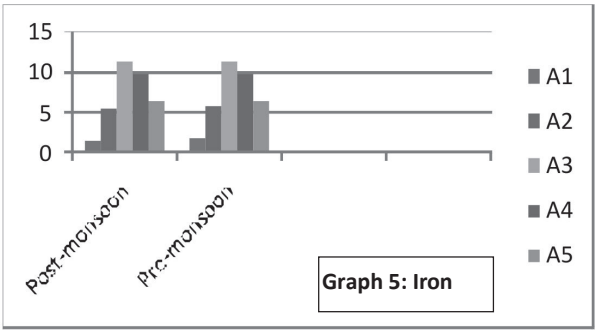
MetalSampling area	Cd	Co	Cu	Cr	Fe	Ni	Pb	Zn	Mn
A1 post monsoon	-0.077	0.19	0.073	0.097	1.576	-0.086	0.657	0.321	0.1042
A1 premonsoon	-0.064	0.211	0.074	0.099	1.621	-0.083	0.681	0.363	0.1089
A2 post monsoon	-0.09	0.243	0.194	0.11	5.501	-0.081	0.555	0.728	0.3755
A2 premonsoon	-0.0826	0.282	0.199	0.173	5.803	-0.081	0.561	0.731	0.3936
A3 post monsoon	0.036	0.218	1.763	0.761	11.48	0.51	2.581	4.482	0.6345
A3 premonsoon	0.0453	0.2267	1.7964	0.7626	11.49	0.59	2.591	4.496	0.6589
A4 post monsoon	-0.035	0.064	0.441	0.313	9.893	0.009	1.501	2.33	0.7963
A4 premonsoon	-0.0245	0.067	0.457	0.343	9.897	0.010	1.531	2.42	0.8925
A5 post monsoon	-0.116	0.172	0.113	0.11	6.295	-0.057	0.555	0.706	1.9582
A5 premonsoon	-0.118	0.179	0.115	0.13	6.299	-0.055	0.562	0.708	1.9924
WHO limit (mg/L)	0.005	0.01	0.05	0.05	NA	0.02	0.05	5	2

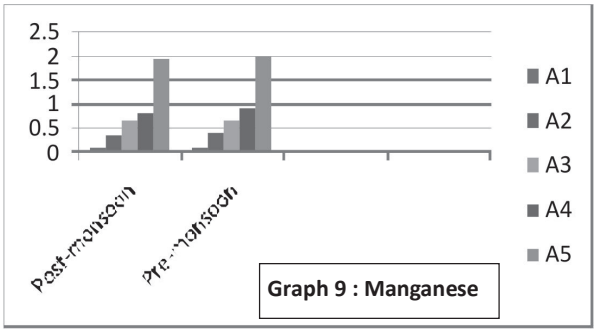


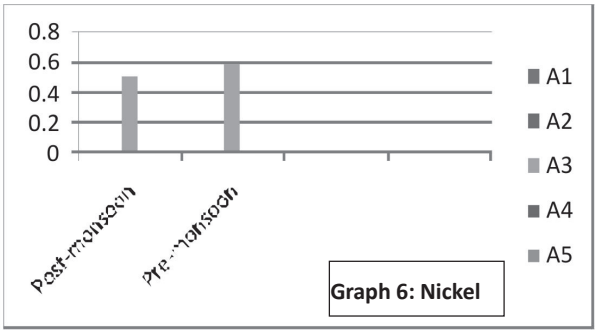












heavy metal concentration after monsoon could be because of washing off the metals or dilution of the river water. There is a need to be further investigation to study post-monsoon concentration of heavy metals.

CONCLUSION

The present study shows that different water samples from different areas have heavy metals in different concentrations. It is a matter of concern, the water sample from area A3 (Sangamwadi Bridge) showed highest level of concentrations of all the different heavy metals. Exposure to heavy metal continues although several adverse health effects of heavy metals have been known for long time.

REFERENCES

APHA, 1989. *American Public Health Association, Standard Methods for the Examination of Water and Waste Water*, 17th Edition, Washington DC.

WHO, 1983. *International Standards for Drinking Water*. World health Organization.