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Detection of trace metals in surface sediment of Tapti River: A case study

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ABSTRACT

The concentration and distribution of selected trace metals in surface sediment of the Tapti river at different station were studied .The analysis of bulk sediments shows that the concentration of iron ,magnege,copper,zinc ,and molybdenum varies from 3.60, It was observed that Iron concentration shows much variation among all ten station Pisavar station shows much highest concentration of iron and that of prakasha station shows lowest concentration. In case of Zinc it can be observed that concentration of Zinc not close to each other among all these stations Sarangkheda station shows higher concentration of Zinc.Magnesium concentration not much differ at all stations. Copper concentration varies from 0.52 to 4.07 ppm. copper concentration at sarangkheda station shows highest value.Molebdenum also shows variation but concentration of MO is very low compared to other trace metals at all ten station taken for the study. The analysis indicators of overlying water quality and its study is useful tool in assessment of environmental pollution.

INTRODUCTION

It is now widely recognised that urban and road runoff waters carry significant loads of pollutants,including heavy metals, hydrocarbons, pesticides, bacteria and nutrients [1-4]. Depending on the river morphology and hydrological conditions, suspended particles with associated contaminants can settle along the watercourse and become part of the bottom sediments, often for many kilometres downstream from the chemical sources [5-7]. since sediment contamination by trace metals in rivers has become an issue of increasing environmental concern. Such contamination is often caused by human activities, including mining, smelting, electroplating and other industrial processes that have metal residues in their wastes, and by non-point source surface runoff. These studies have improved our understanding of trace metal contamination in river . Monertoring the trace metal enrichment in sediment is an important componenty of understanding environmental pollution.The metals which are known to toxic to the aquatic life and aquatic system are lead ,Cdmium,Mercury, copper, Zinc,Iron and Magnege. Some of these metals are toxic when in excess.The sources of heavy metals to the river sediment are generally includes wheathering of rocks ,dissolution of these metals from natural depositions ,discharge of man made effluent from mining of various minerals from the respective mine most of the metal discharge occure from metallurgical industries of different

types.Other industries which discharge trace metals from their effluent are paint industry , Fertilisers [8,9]

The Tapti river originates from high range of Satpura mountain at Multai in Madhya Pradesh of central India as a small stream it passes through state Madhya Pradesh,Maharashtra and Gujrat. Large amount tributaries of varying dimensions merge their identity with this river.Tapti river respectively worshiped by millions of Indians.Tapti and its tributaries constitutes large river system in India and finaly meet arebean sea near Surat. Number of industries located along the bank of Tapti river and discharge their effluent to river.There are long standing complaints about water pollution causing fish mortality and also serious damages to the agricultural crop resulting in extensive unemployment in region of Tapti river.

Study area in present investigation of tace metals in sediment of Tapti river limited about 300 Km length streaching from surat ti Shindkheda (Dist.:Dhule,Maharashtra)

MATERIALS AND METHODS

Collection and Treatment of Samples:-
The sediment samples collected were collected from ten different sampling strations of Tapti River starting from 1) Surat 2) Kukarmunda 3) Hatoda 4)Nimbhora 5) Pisavar 6) Prakasha 7) Sarangkheda 8) Torkheda 9) Sulwada 10) Sukhwad. Covering the region of 300 Km .Each station is composed of three sampling spots which covering the entire cross section of the river.The 2 cm top layer was carefully scooped off from all the grabs using a polyethylene spoon taking care to minimize the contamination. The samples was then homoginised,air dried and stored at 5^{o} C in polyethylene container .For each sample known quantity (~ 1gm) of sediment was digested with a solution of HClO4 (2ml) and HF (10ml) and heat to near dryness, subsequently a second addition of HClO4 (1ml) and HF (10ml) was made and the samples was evaporated until to near dryness. Finally HClO4 (1ml) alone was added and the samples was evaporated until white fumes appeared. The residue was dissolved in concentrated HCl (1) and diluted to 25 ml .

2.1.Analysis of Trace Metals:-

Trace metals concentration iron ,manganese,copper,zinc ,and molybdenum were measured using Atomic Absorption Spectrophotometer (AAS Perkin Elmer Model 5000).The accuracy of the analytical procedure was assessed by using the certified reference material.

RESULT AND DISCUSSION

Sediment samples from ten different stations of Tapti River were observed fro trace metals by using Atomic Absorption Spectrophotometer (AAS).Trace metals such as Iron,Zinc,Manganese,Copper and Molybdenum were analysed. The detected metals are being discussed individually under the following headings:

3.1) Iron (Fe):-

The trace metal Iron concentration ranges from 1.88 to 5.71 ppm in ten sediment samples of Tapti river from different stations.The concentration of Iron in sediment sample collected from station 5 (Pisavar) is much higher than those in sediment samples collected from other nine stations . This high concemtration of iron in this sediment may be attributed to a result of weathering of soil and rocks by various activities of human these may be mining,use of metal

contaminated substances ,smelting ,processing , use of high yielding fertilisers for agricultural products and higher prepatation at high pH and salinity (4)

Lower concentration of Fe observed in sediment sample collected from station 6 (Prakasha).the distribution of iron over all stations are not uniform.

3.2)Zinc:

Trace metal zinc in Tapti river sediment samples ranges from 1.171 to 6.066 ppm in ten sediment samples from different stations. An average zinc concentration in sediment samples of Tapti river is 3.037 ppm . It is found that station 7 (Sarangkheda) has comparatively higher concentration than other samples and minimum concentration was observed at station 4 (Nimbhora).The concentration of zinc observed in the samples are not very close but much variation observed The variation of zinc among these samples attributed to natural contribution from earths upper continental crust , human activity ,wheatharing of soils and rocks and most important is the presence of clay minerals and organic matter in sediment and also the use of yield crop fertilizers.

3.3) Manganese (Mn):

The trace metal manganese in Tapti river sediments (Table 1.) from ten different stations ranges from 6.008 to 8.901 ppm. An average manganese concentration among these ten sediment samples of Tapti river stations is 7.411 ppm. Among these ten stations Tapti river station 7 (Sarangkheda) has comparatively higher concentration of mangnege than other nine stations. Most of the samples shows much closeness in concentrstion of manganese this may be due to natural contribution from earth surface soil and use of fertilisers.

3.4) Copper :

Copper containt in ten sediments (Table 1) samples of Tapti river from different ststions showd variation in most of the samples , the copper concentration are in the range of 0.52 to 4.07 ppm Maximum concentration of copper is found at the station 9 (Sulwasda) i.e. 4.07 ppm .The presence of copper may be due to spraying of fungicides,insecticides , herbicides an agricultural field. The high concentration of copper may be due to high alkalinity of water when most of the copper precipitated. Some authors also reported that most of the metal in the water precipitated down in to the sediment , if pH increased . Generaly increase in sediment pH increses the number of sorption sites available in clay material. Minimum concentration of copper among all sations of sediment samples is found at station 6 (Prakasha) and overall average concentration is 1.959 ppm.

Table 1.Trace metal concentrations in sediment samples

Sr. No.	Stations of Sample Collection	Metals Concentration in ppm				
		Fe	Zn	Mn	Cu	Mo
1	Tapti river sediment near Surat	3.60	2.798	7.109	2.43	0.045
2	Tapti river near Kukarmunda	3.07	3.155	7.199	1.44	0.046
3	Tapti river near Hatoda	3.79	4.101	7.010	1.18	0.047
4	Tapti river near Nimbhora	3.81	1.171	7.817	1.46	0.041
5	Tapti river near Pisavar	5.71	2.09	7.191	2.63	0.042
6	Tapti river near Prakasha	1.88	3.99	6.008	0.52	0.051
7	Tapti river near Sarangkheda	4.18	6.066	8.901	1.59	0.055
8	Tapti river near Torkheda	4.43	4.001	8.017	2.48	0.050
9	Tapti river near Sulwada	4.3	3.591	6.987	4.07	0.043
10	Tapti river near Sukhwad	4.09	2.116	7.871	1.79	0.040

3.5) Molybdenum (Mo):
Molybdenum was analysed in sediments of ten different stations (Table 1) collected from Tapti river basin.The concentration Molybdenum in ten sediment samples was found to be in the range of 0.040 to 0.055 ppm and the avaarage concentration of Molybdenum among these stations in Tapti river was0.0462 ppm ,mwhich is very less as compared to other trace metals present in Tapti river sediment. Maximum concentration of Molybdenum was found at station 7 (sarangkheda). It is attributed to water precipitation of Molybdenum down thesediment.

CONCLUSION

In the present study detection of trace metals in Tapti river sediment collected from ten different stations is presented. From the study it was observed that Iron concentration shows much variation among all these stations Pisavar station shows higher concentration while Prakasha station shows much less concentration may be due to variation in wheathering , precipitation and presence of variable heamatite and goethite ore. Zinc concentration among these stations shows much variation, higher concentration was observed at station sarangkheda and that of lower concentration at Nimbhora station. Variation in zinc concentration may be attributed to the natural contribution of earth, human activity and wheathering of soil. Manganese concentration among these ten stations are not uniform but not much differ from each other. Higher concentration are observed at station Sarangkheda and lower concentration at station prakasha these variation in concentration attributed to mivrobial activity, oxidation reduction reaction,change in pH ,organic matter sewage and sludge deposition,metallurgy. Concentration of Copper varies from 0.52 to 4.07 ppm, maximum concentration is appered at station Sulwada and minimum at Prakasha satation average concentration among all these station is 1.959 ppm. The concentration variation may be due to the uneven distribution of various factors such as fungicides,insecticides ,pH ,wheathering and precipitation reaction, land run off and various industries such as metal industries , pigment,domestic utensile,copper wive,batteries etc.The concentration of molybdenum is very small as compare to other metals at same stations. Higher concentration of molybdenum is found at station sarangkheda and minimum concentration at station sukhwad. Change in concentration attributed to various factors such as pH ,pesticides precipitation, sedimentation ,decomposition of clay and rocks.

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REFERENCES

[1] G. Chebbo, Solides des rejets pluviaux urbains, caractérisation et traitabilité. Ph.D. Thesis, Ecole nationale des ponts et chaussées, Paris, France **1992**.
[2] M.Legret, Le Marc, C. and Demare, D. *Bull. Labo. Ponts et Chaussées* **1997** 211, 101–115.
[3] C. Pagotto,. Etude sur l'emission et le transfert dans les eaux et les sols des traces métalliques et des hydrocarbures en domaine routier. PhD. Thesis, Poitiers University, France. **1999**
[4] J.J Sansalone., S.G. Buchberger, *Journal of Environmental Engineering ASCE* **1997** 123, 134 – 143.
[5] D.Ciszewski, *Environmental Geology*, **1997,** 29, 50,
[6] L.VIGANÓ, *Water Res*., **2003** ,37, 501,
[7] WILDI W., *Research and Management*, , **2004** 75,
[8] H.D.Foth and B.G.Ellis, Soil Fertility Willey New York, **1989** 33-85.

[9] Fic, Michael, Isenback, Schroler, Morgot, *J. Contaim. Hydrol*. **1989** 4 (1),11