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Trace Metal Analysis of Godavari River Water at Paithan Aurangabad District, Maharashtra, [India]

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ABSTRACT: In recent years, the new environmental issues are arising due to industrial hazard, waste generation, global climate change, ground water contamination and it gives an attention to preserve environment. One of the major sources of contamination of water is improper discharge of industrial effluents which contains so trace metals which cause severe negative effects on the human life. Trace metals contamination is one of the major problems globally, especially in highly developing countries. Systematic monitoring of trace metals was carried out at Paithan in the Holy Godavari River basin to estimate the metals like Mn, Fe, Cu, Pb, Cd, F and Zn in water deposits in at months to identify the level of trace metals in the Godavari River. For the present assessment spectrophotometer was used. It is observed the average of Iron is 0.497, Copper is 0.3775, Manganese is 0.209, Lead is 0.391, Cadmium is 0.020, Zinc is 0.174 and Fluoride is 1.574. On the basis of study suggested that the trace metals contamination should be avoided so as to retain quality of river water which provide great habitat for the flora and fauna including abiotic factors. These rivers contribute important socio-economic roles to provide numerous benefits like drinking water, washing, fishing, transportation across the city.

KEYWORDS: Contamination, Monitoring, Assessment, Pollution.

I.INTRODUCTION

Water plays an important role domestic, industrial supply, irrigation all over the world. But increase of population, industrialization and urbanization causes pollution of ground water. The contamination ground water is not easy to restore. Hence it is necessary to protect quality of ground water. According to WHO 80% of diseases are arises due to contamination ground water. Trace metal contamination of water bodies ranks among the major ecological problems globally, with many issues reported from developing countries in recent times[1]. The extent of trace metal pollution in the river implied that the condition was much frightening and most probably severely affecting the aquatic ecology of the rivers. The sources of trace metals in these countries are varied, but notably include land fill, mining activities, tanning, textile and various cottage industries. Metals from the industrial activities, agricultural sources, urban runoff, atmospheric deposition, and automobile emissions could also disperse to the surface water via surface runoff or rain water[2]. Especially the trace metal contamination in the ground water shows serious health issues. The entrance of contaminants into the surrounding due to artificial and natural activities is one of the most vital issues facing by the present communities [21]. Generally, metals such as copper, iron, manganese, zinc and cobalt are very essential but increasing concentrations causes the severe health issues. The traces of metal ions play an important role in the human life. Some of these are very toxic trace elements such as Fe, Ni, Pb which affects the central nervous system (CNS) [3]. Trace metals can enter the river system through possible pathways, including disposal of liquid industrial effluents, traffic emissions, brick kilns, terrestrial runoff and leachates which carries chemicals originating from numerous urban, industrial and agricultural sources, as well as atmospheric deposition[4]. Trace metals are known as inorganic contaminants and can accumulate for long periods underwater body [5]. Trace metals are widely utilized in automobiles, paints, textile, and mining industries [6, 7]. Certain trace metals such as copper, zinc, iron, manganese, and cobalt play very crucial roles in the biological metabolism at low concentrations. However, chromium, lead, cadmium, and mercury can be toxic even at very low concentrations [7, 8]. In most of the countries at global level, groundwater and surface water in agricultural areas are at a serious risk of metal pollution, due to rapid industrialization and urbanization, and intensification of agriculture [9].

II METHODOLOGY

The trace metals namely Copper (Cu), Cadmium (Cd), Iron (Fe), Zinc (Zn), Lead (Pb), Manganese (Mn) and Fluoride(F) were analysed and the samples were determined by a spectrophotometer (Hitachi Z-6000). The discharged volume of all key pollutants including waste water and industrial solid waste increased significantly, with a sharp increase in particular of discharge of soot [11]. The samples collected from the study area were analysed for their physical and chemical properties for determining their designated best utilization of ground water. All samples were sent to the laboratory for present analysis. Since, most metals associate with the surfaces in particles, they are preferentially transported, sedimented and finally buried with fine-grained, high surface area sediments [18, 19, 20].

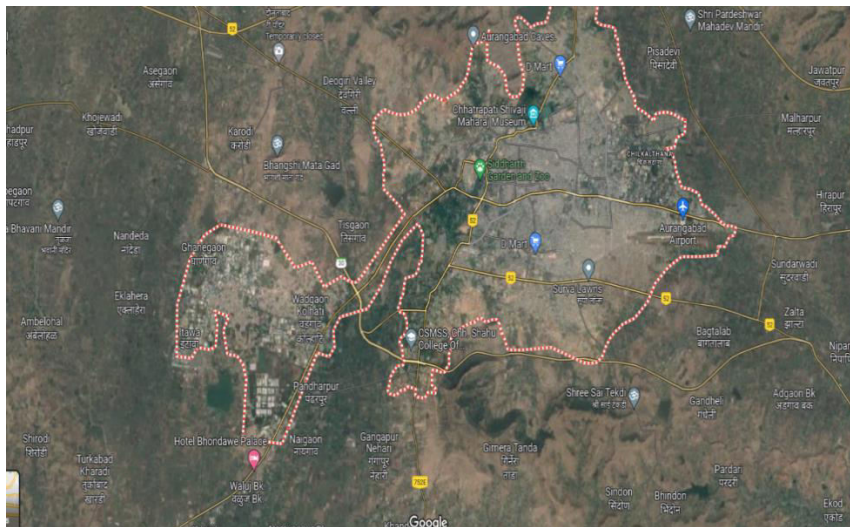


Fig 1: Map showing sampling site

Aurangabad District is situated mainly in the Godavari River basin and partly in the river Tapi basin. The district is from 19 to 20 degrees north longitude with the 74 to 76 degrees to the east latitude [10]. Collection and Analysis of the water samples were carried out at regular interval for a period of a year. Physical and chemical parameters of the samples were analysed systematically. The concentrations of the trace metals iron, copper, cadmium, zinc, fluoride lead and manganese were determined. Water temperature was recorded with thermometer. pH was measured by using digital pH meter. TDS was measured by using a Portable Water Analyzer Kit. Samples were collected during a field survey in order to identify the hydro chemical characteristics and quantify trace metal content, estimate the potential risk posed by the presence trace metals in the surface water and the groundwater reveal the sources of trace metals in the surface water and the influence of surface groundwater interactions on trace metal distribution in the groundwater, For the present work spectrophotometer was use to analyse the trace metals [2]. Human health will be at risk when they consume contaminated organisms with trace metals by the process of magnification process such as fish. Even though the human body requires some trace metals such as Cu, Fe and Zn in trace amounts, at the same time excessive levels of these metals is detrimental to the human body.

III.RESULTS AND DISCUSSION

Trace metals in waters are non-degradable and remain present for longer period of time and need to be carefully monitored. The study provided an understanding on the extent of contamination of these metals and their spatial and monthly distribution in the aquatic environment of the rivers. Some water samples are found to be more concentration of metals exceeded maximum limits values of WHO, ISI standards. The result gives important data of ground water quality. The results obtained have been tabulated in Table. The observed values have been tabulated in the table and graphically represented in fig. no. 2 to fig. 8 [12].

Table 1: Average of Trace metal observed in the study area

Station No.	Iron (Fe)	Copper (Cu)	Manganese (Mn)	Lead (Pb)	Cadmium (Cd)	Zinc (Zn)	Fluoride (F)
January	0.442	0.4209	0.2183	0.4146	0.0204	0.1872	1.601
February	0.455	0.3867	0.226	0.3914	0.0156	0.1713	1.5482
March	0.6426	0.4281	0.244	0.4117	0.0162	0.1802	1.651
April	0.2424	0.325	0.170	0.3589	0.0196	0.1681	1.4972
May	0.25	0.332	0.1721	0.3945	0.016	0.1720	1.5252
June	0.311	0.304	0.2063	0.3968	0.0174	0.1822	1.661
July	0.302	0.421	0.1973	0.3523	0.012	0.1690	1.531
August	0.425	0.3711	0.2063	0.4110	0.0202	0.1611	1.6611
September	0.4103	0.410	0.2127	0.4123	0.0285	0.1723	1.5784
October	0.5141	0.405	0.2085	0.3745	0.0255	0.1785	1.5326
November	0.5112	0.3140	0.245	0.4120	0.0260	0.1802	1.5247
December	0.4973	0.413	0.2130	0.3642	0.025	0.1702	1.582
Average	0.4973	0.3775	0.2099	0.3911	0.0202	0.174	1.5744
Max.	0.6426	0.4281	0.245	0.4146	0.0285	0.1802	1.661
Min.	0.25	0.304	0.17	0.358	0.012	0.1611	1.5247

According to the results of the chemical Analysis, the elements were ordered in terms of their obtained result values: F>Fe >Pb>Cu>Mn> Zn>Cd. It can be concluded that the concentration of Fe, Cu, Pb, and Mn were found to be higher compared to remaining metals in the research samples. Certain trace metals such as Cd and Pb was classified as non-essential trace metals while Cu, Zn and Fe were classified as essential trace metals. Non-essential trace metals are very harmful to human health because these trace metals are toxic even in the small amounts. It is reported that the concentration of trace elements in the river water did not meet the limits of cadmium set by the World Health Organization if the rate of Zn in the growth is zero[15, 16].These harmful trace metals caused by some artificial activitiesmay be accumulated in the water and living organisms through the food chain.

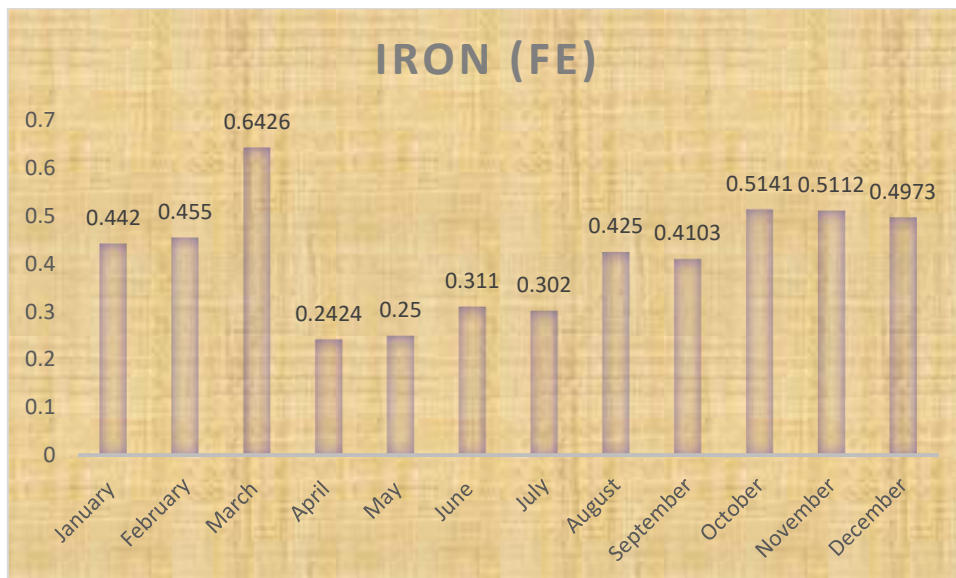


Fig2:Analysis of Iron (F) levels in the river

In our present study all the samples are exceeds the max concentration according to WHO (2006) and ISI standards. Fe is abundant in the earth while Mn originates from weathering of parent material and subsequent pedogenesis [13].

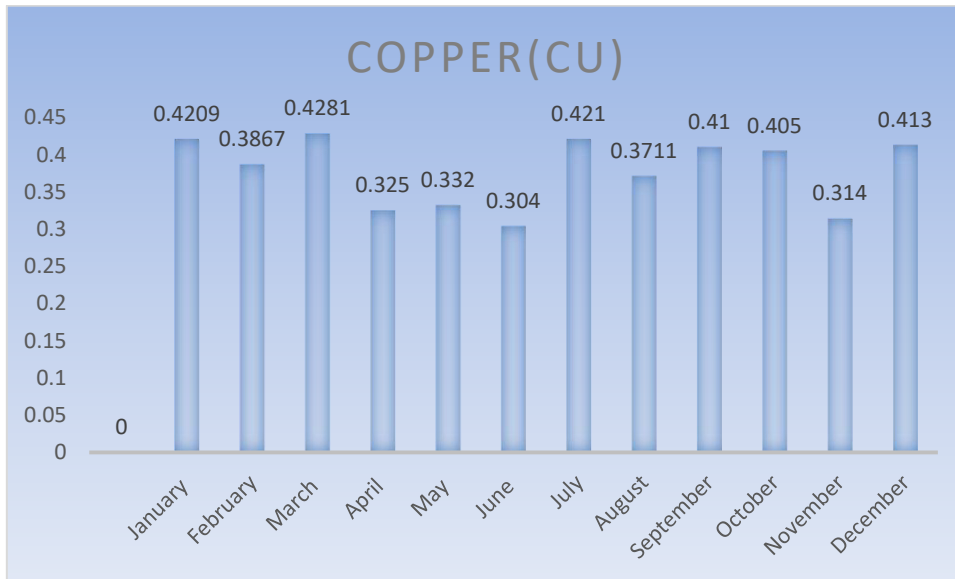


Fig. 3: Analysis of Copper (Cu) levels in the river

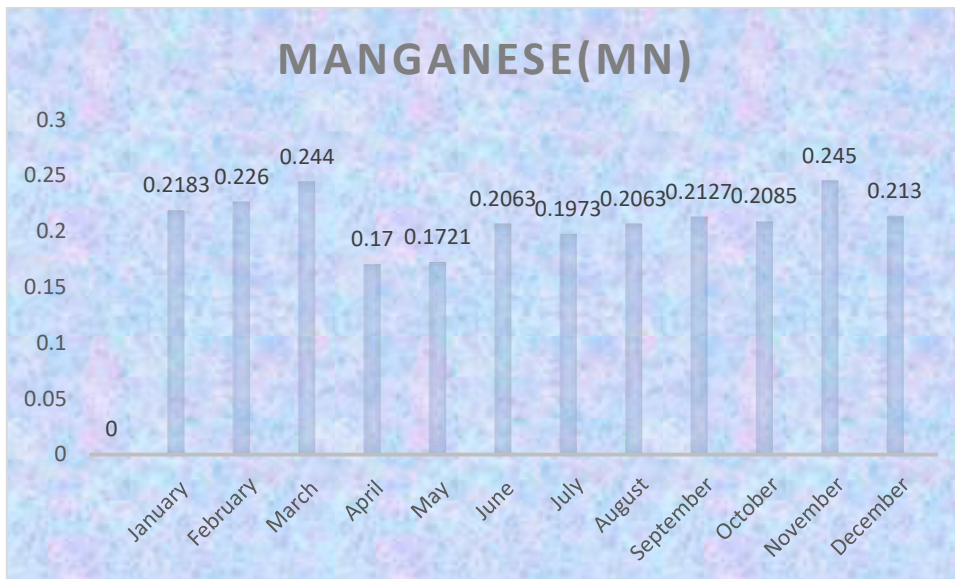


Fig 5: Analysis of Manganese (Mn) levels in the river

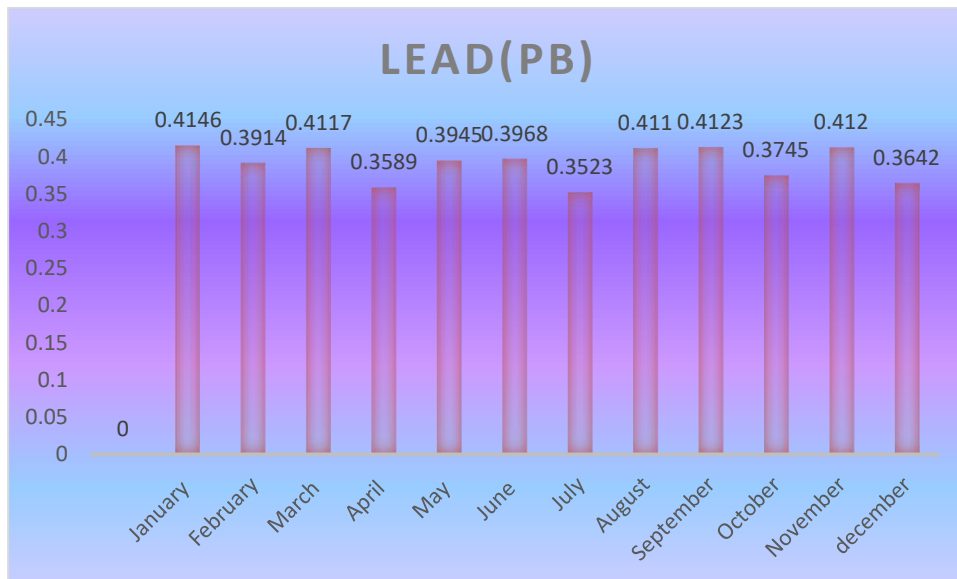


Fig 6: Analysis of Lead (Pb) levels in the river

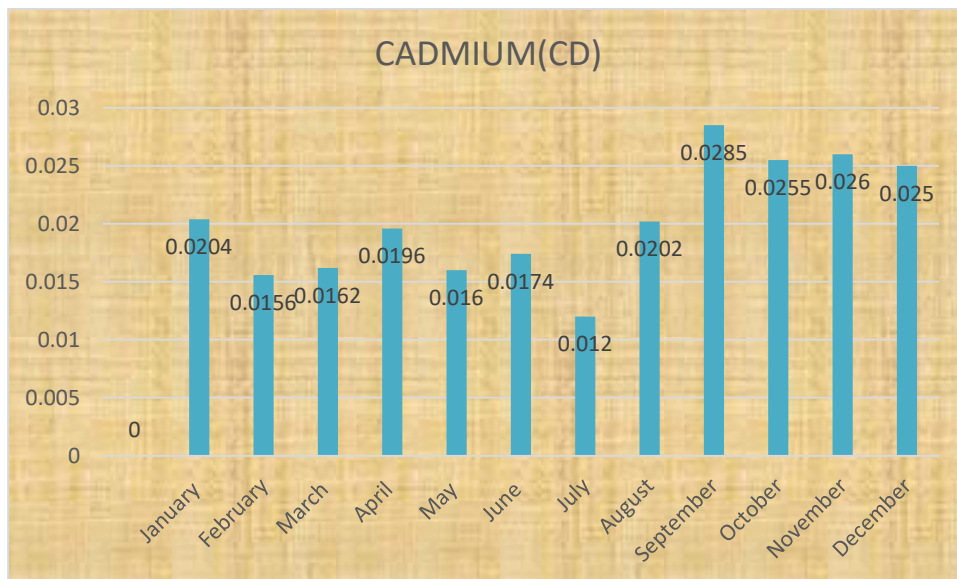


Fig.7: Analysis of Cadmium (Cd) levels in the river

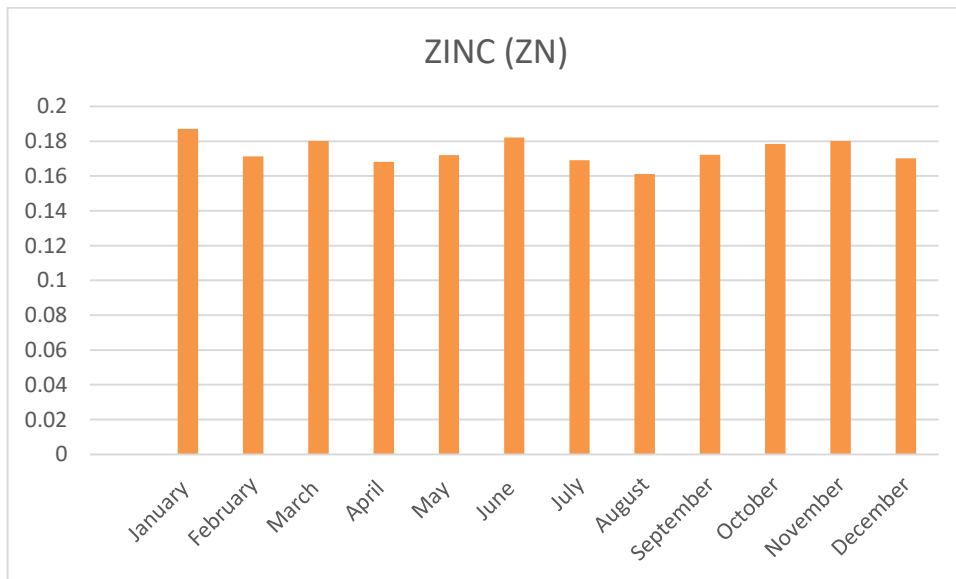


Fig 8: Analysis of Zinc (Zn) levels in the river

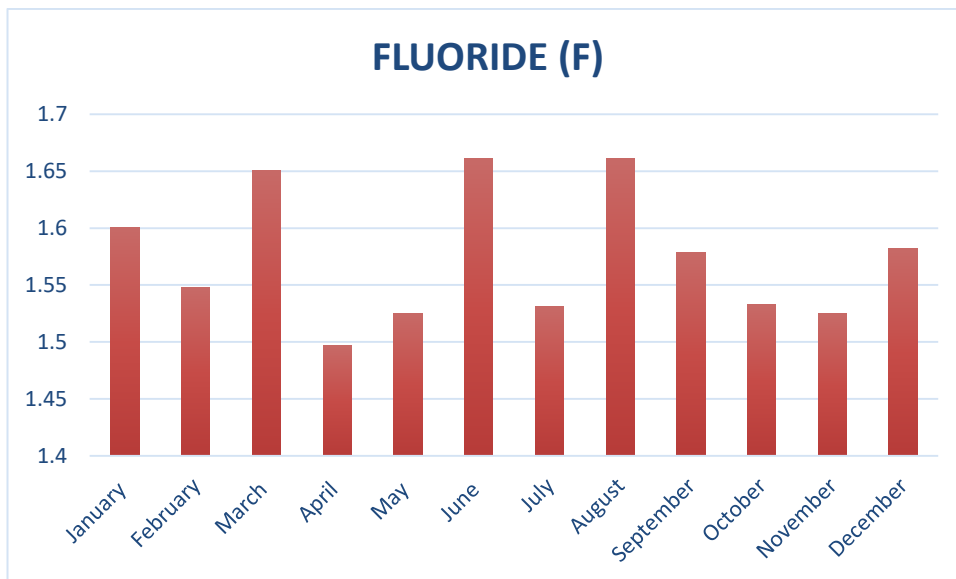


Fig 9: Analysis of Fluoride (F) levels in the river

Based on prevailing pedogenic processes, Zn can have a basic lithogenic source as it forms a number of soluble or insoluble salts [14].

IV.CONCLUSION

Trace metal Analysis identifies and quantifies very small amounts of metals and heavy metals in a sample. Although having some trace metals in our diet is essential for our own well-being. The present research work was carried out in the Godavari River at Paithan in which spectrophotometer was use to analyse the parameters. The observed values of Iron 0.4973, Copper 0.3775, Manganese 0.2099, Lead0.3911, Cadmium 0.0202, Zinc 0.174 and Fluoride is 1.5744, and it is concluded that the levels of trace metals are partially in the standard levels. Trace metals performs crucial role in maintaining normal habitat of the aquatic ecosystem. It shows that the water sample of the rivers was partially contaminated with trace metals.The distribution and sources of trace metals in the surface water are impacted not only by geogenic factors, but also by the agricultural activities and industrial sources.

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