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Impact of industrial waste on water quality around Mahad MIDC area district Raigad Maharashtra.

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ABSTRACT

Most recently, there have been a growing number of publications focusing on water pollution, considering this, the assessment of ground water quality of Mahad M.I.D.C. industrial area is carried out. Water around this area is utilized for domestic and drinking purpose and therefore it is important to assess the quality of water. The mass industrialization and the rising urbanization are key reasons for the abrupt increasing pollution of water. Therefore, focusing this issue, the present study aims to validate the water pollution due to heavy metals. The samples of water were collected from rivers around the industrial area at each month throughout the year. The heavy metals namely iron, copper, zinc, manganese, nickel, chromium, cobalt and lead were determined by using Atomic Absorption Spectrophotometer. The evidence from this study suggests that, the few of the heavy metal concentration in this area is increasing unexpectedly.

KEYWORDS

Water, heavy metal, Pollution.

1. INTRODUCTION

Metals pollution in the water is because of human and natural processes. Certain metals like cobalt (Cd), copper (Cu), zinc (Zn) and selenium (Se) are important for humans, but their high level show adverse effect on living organisms. Metal such as cadmium (Cd), chromium (Cr) and lead (Pb) are very toxic even at minute concentrations [1]. Heavy metals like; Hg, Cd, Pb, and Cr were found to be very toxic pollutants. Human activities are majorly responsible for the entrance of these metals into the water as pollutant. These metals gets accumulated into the animals and human body, they may leads to the serious diseases like cancer[2]. Water quality assessment and monitoring is very vital issue for the better life of all the living organisms, especially river water as it is used by human beings [3]. The pollution of these sources by various anthropogenic activities adversely effects on ecosystem and human health[4-5]. The disposal of industrial waste water is serious environmental issue. Many chemical processes from industries generate waste containing contaminants like heavy metals. Heavy metals such as chromium, zinc, iron, mercury and lead are the most immediate concern according to the World Health Organization (WHO 1984). In many developed and developing countries the limits of contaminant in treated waste water are enforced to maximum allowed limit. Issues related with the pollution of water, soil and natural ecosystems are well reported[6].

Heavy metals that are step by step enriched and accumulated in biological chains affecting human health, are one in all the chemicals presume to injure the aquatic atmosphere [7-9]. Thus, heavy metals from these anthropogenic sources cause serious problem to the atmosphere and human health and became a wide concern due to their bioaccumulation, abiotic degradation, persistence, and toxicity[10-14]. The origin of heavy metals pollution in river may be due to the anthropogenic activities, industrial waste, weathering, municipal waste, domestic waste and atmospheric deposition[15]. Pollutants like heavy metals are widespread into the water. The primary sources of these are from industrial regions wherever streams and rivers flow. Small concentrations of serious metals in water affects detrimentally on the surroundings, step by step with the time they deposits in the animal and plants, inflicting the modification in their organic chemistry balances. During this means, some organic chemistry reactions are barred or catalytically lead to some unwanted directions. Consequently, several organisms will basically get harm and alter the natural surroundings. Therefore, correct information concerning the presence of poisonous metals in water is of important environmental issue [16]. The objective of the study is to assess the contamination of surface water sources surrounding a major industrial region in MIDC, Mahad, Raigad, Maharashtra, western Ghats of India, subjected to large scale industrialization and producing large number of pollutants which are causing serious problems amongst the human beings and animals in the respective area.

2. MATERIALS AND METHODS

The aim of this study was to evaluate the concentration of heavy metals in ground water around the study area Mahad which is located on the Arabian Sea in the costal Kokan region of

Maharashtra, south of Mumbai. The geographical coordinates of selected area are Latitude 18°6'12"N and longitude 73°28'40"E, elevation above mean sea level (meters) 177.5m approximately to analyze if, parameters such as, location of sample, depth of sampling spot, sample pH, sample conductivity and population burden has an impact on presence of heavy metal contents and heavy metal concentration.

Fifteen (15) water samples were obtained from different locations of river during the period of August-2017 to July-2018. To avoid possibility of contamination the empty polythene bottles were used for the collection of water samples and were accurately labeled. Two samples were collected from each and every spot in which one samples of 50 ml was mixed with 4 ml of HNO_3 (Nitric acid) for sample preservation (APHA,1992). The analyses of the samples were carried out as per the methods of APHA [17].

3. RESULTS AND DISCUSSION

Table 1. Month wise mean of metal concentration of heavy metals from different sample stations.

Heavy metal	August	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June	July
Fe(mg L-1)	0.072	0.069	0.072	0.067	0.073	0.077	0.083	0.089	0.072	0.055	0.085	0.07
Zn(mg L-1)	0.045	0.047	0.05	0.049	0.051	0.049	0.049	0.047	0.05	0.047	0.047	0.042
Cu(mg L-1)	0.017	0.057	0.074	0.063	0.064	0.076	0.0787	0.079	0.013	0.031	0.024	0.015
Mn(mg L-1)	0.03	0.022	0.01	0.012	0.02	0.032	0.034	0.037	0.077	0.088	0.04	0.032
Ni(mg L-1)	0.042	0.035	0.029	0.024	0.031	0.03	0.034	0.034	0.053	0.052	0.055	0.044
Cr(mg L-1)	0.006	0.012	0.025	0.027	0.024	0.031	0.033	0.037	0.046	0.042	0.026	0.021
Co(mg L-1)	0.0008	0.001	0.003	0.003	0.007	0.004	0.005	0.006	0.002	0.011	0.007	0.001

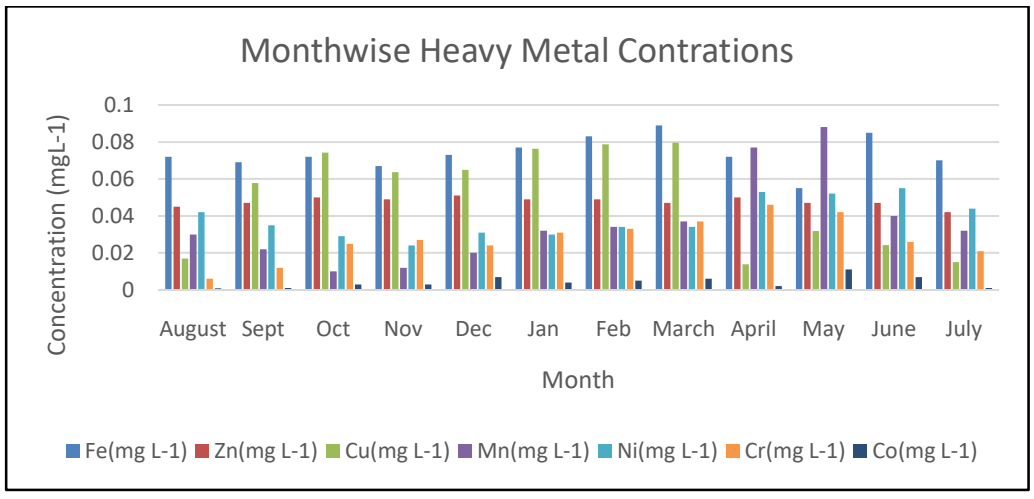

Chart 1. Month wise Heavy Metal Contractions.

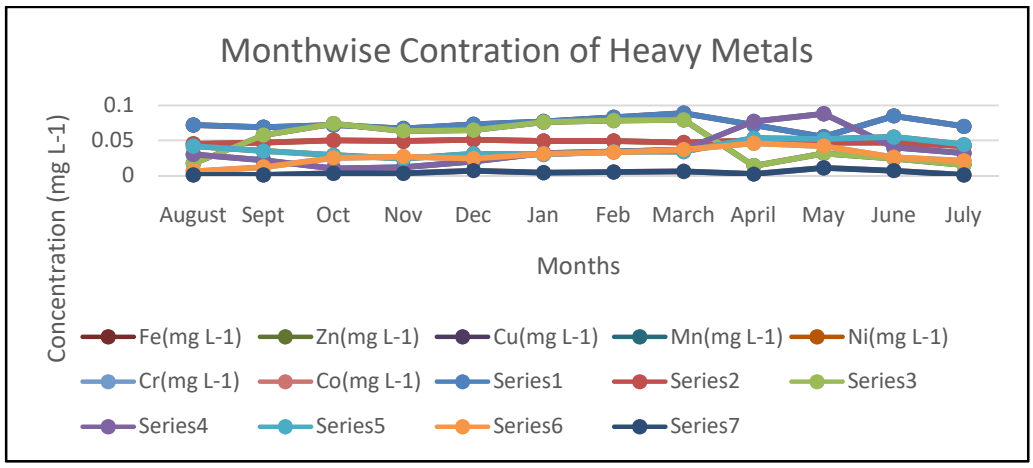

Chart 2. Month wise Contraction of Heavy Metals.

3.1. Iron

The iron concentration in the surface and ground water varies from 0.055 to 0.089 mgL^{-1} throughout the year having mean value 0.073 mgL^{-1}. The iron concentration into the water is may be due to high iron content present red soil of study area. The content was found to below the WHO (2008) guidelines for drinking water. It is consistent with the data obtained by Manoj Kumar dev et. al.[18]. (2017) in study of water analysis near the Lote industrial area, Maharashtra.

3.2. Zinc

The concentration of zinc ranged from 0.042 to 0.051 mgL^{-1} and its mean value was 0.047 mgL^{-1}. In this analysis 0.051 mgL^{-1} was the highest noted concentration during the month of December, it may be due to the use of zinc as a catalyst for some of the chemical process is common as the industries in this area are mostly chemical industries. The result obtained is in agreement with the S. Jabeen et.al. Findings which shows fluctuation in Zn concentration during water analysis[19].

3.3. Copper

Copper is important metal from the heavy metals in trace quantity. When Cu concentration exceeds the permissible limit, it damages aquatic life and human beings. Cu concentration in study area was found in the range of 0.013 to 0.079 mgL^{-1}(mean: 0.049 mgL^{-1}). Highest concentration for copper was found in the month of March, it may be due to use of copper to more extent during this period of year by the chemist. This observation supports the previous research carried out by S. Jabeen et.al. [19], which links the use of copper in chemical industries. Similarly RachnaVirha et. al. found increase in copper concentration into the water due to waste disposal from nearby industries and hospitals[20].

3.4. Manganese

Maximum concentration of Mn was recorded (0.088 mgL^{-1}) was in month of May was found to be exceeds the drinking water quality standards of European Union and lowest concentration reported was (0.01 mgL^{-1}) in month of October which was found to be below the permissible

limit of European Union water quality standards. This result further supports the idea of Manoj Kumar Dev et. al. for pollution of water due to industrialization and anthropogenic activities[18].

3.5. Nickel

The concentration of Nickel range between 0.024 to 0.055 mgL^{-1}. Highest concentration was reported in the month of June. The maximum value found to exceed the limits of European Union water quality standards.

3.6. Chromium

The Chromium concentration was found to be in the range of 0.006 to 0.046 mgL^{-1}. This is lying below the limit of WHO (2008) and EU (1998) standards.

3.7. Cobalt

The average cobalt concentration in the water was ranged from 0.0008 to 0.011 mgL^{-1}. (Mean: 0.0042 mgL^{-1}). These results corroborate the ideas of Buyyan who suggested the relation between water pollution and industrialization[19].

4. CONCLUSION

Industrialization and urbanization in the last decade in Mahad area is primary cause of abrupt increase in heavy metal concentration in this area. The study area was differentiated into different parts according to variation in location around the MIDC area. The result shows that variation in metals concentration is not uniform from East to West as water is flowing towards western zone to meet the sea. It could be noted that the metal rising concentration in area is due to industrialization in the area. Moreover, sampling stations which are more influenced by the industrial discharge are showing more concentration of the metals. Potential contamination of the metals like Cu, Cr, and Ni, are observed during the study. Metals concentration above the acceptable limit may adversely affect the animals and plants come in contact with the polluted water. In summary, the present study provides ground information for interpretation of variations in heavy metal concentration in water and around Mahad MIDC area. The data presented here can also help to monitor the water quality in future around study area.

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