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Studies on status of some heavy metals in major drinking water reservoirs in Nanded district (Maharashtra) and its environmental impact

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Abstract
The concentration of heavy metals in the vishnupuri reservoir is higher than the Barul reservoir. The heavy metals present in the water bodies which may affects the human health and the health of aquatic ecosystem. Water samples were collected form the selected sites of vishnupuri and Barul reservoir for the determination of heavy metal concentration in water. In the present investigation determined the three heavy metal i.e. Iron, Copper and Manganese were analyzed by standard methods suggested by APHA 1995 and NEERI, 1988. The results are shown the higher concentrations were found in the Vishnupuri reservoir than the Barul reservoir.

Keywords: iron, copper, manganese, Vishnupuri reservoir and Barul reservoir

Introduction
Living organisms require varying amounts of heavy metals i.e. Iron, Copper, and Manganese, are required by humans. Excessive levels can be damaging to the organism. Water is an important factor in the ecological balance. Surface waters pollution with contamination of heavy metals creates problem with serious consequences on health. Heavy metals in small quantities are needed for all in vital forms. In the cells of organism, metals are presented as cations, but their inclusion is strictly regulated in large quantities because they are toxic (Mihai Teopent, 2010) [7]. Heavy metals are getting importance for their non-degradable nature and often accumulate through tropic level causing deleterious biological effects (Jain, 1978) [5].
Dams are sinks for heavy metals that continuously wash off rocks and soils that are directly exposed to surface waters. The common sources of heavy metals are from dead and decaying vegetation, animal waste, wet and dry fallouts of atmospheric particulate matters and from anthropogenic activities (Shaikh Parveen 2012) [11]. Heavy metal pollution can arise from many sources but most commonly arises from the purification of metals. Through precipitation of their compounds or by ion exchange into soil and mud, heavy metal pollutants can localize and lay dormant. Unlike organic pollutants, heavy metals do not decay and thus pose a different kind of challenge for remediation. Currently, plants or microorganisms are tentatively used to remove some heavy metals such as mercury. Plants which exhibit hyper accumulation can be used to remove heavy metals from soils by concentrating them in their bio matter. Some treatment of mining tailings has occurred where the vegetation is then incinerated to recover the heavy metals. (Ron Zevenhoven, 2001) [10].
Heavy metals like Fe, Cu, Zn, Ni and other trace elements are important for proper functioning of biological systems and their deficiency or excess could lead to a number of disorders. Food chain contamination by heavy metals has become a burning issue in recent years because of their potential accumulation in bio system through contaminated water, soil and air. Therefore, a better understanding of heavy metal sources, their accumulation in the soil and the effect of their presence in water and soil on plant systems seem to be particularly important issues of present-day research on risk assessments**.**
Most of our water resources are gradually becoming polluted due to the addition of foreign materials from the surroundings. These include organic matter of plant and animal origin, land surface washing, and industrial and sewage effluents. The dams have a complex and fragile ecosystem, as they do not have self-cleaning ability and therefore readily accumulate pollutants. The study also aimed at determining how the level of heavy metal pollution in major drinking water reservoir in Nanded region.

Materials and Methods

Strudy Area

Godavari River is a one of the major river in Marathwada region of Maharsshtra. Vishnupuri reservoir is one of the major reservoirs which are also largest lift irrigation project in the country constructed across the river Godavari. Water is reserve mainly for the drinking & irrigation purposes to Nanded city and various nearest villages. Other major project is Manar dam (Upper Manar Project) popularly known as Barul dam which is largest storage capacity of water dam in the district.

The samples will collect from a selected spot at the depth of 1ft below the surface using Nansen type water sampler and kept in polythene containers (500 mL) with the addition of 2 mL concentrated HNO3 at 2 mL in order to preserve the metals and also to avoid precipitation. The pH of water samples will determine by using hand pH-meter at the spot. For the analysis of total heavy metals (dissolved and suspended), water (200 mL) samples digestion is required with5 mL of di-acid mixture (HNO3: HClO4: 9: 4 ratio) on a hot plate and filtration by WhatmanNo. 42 filter paper and sample made up the volume to 50 mL by double distilled water for analysis of selected heavy metals viz. Fe, Cu, Mn, Zn, Cr using Atomic Absorption Spectrophotometer (AAS) (APHA, 1995) [3]. Sample will also check by hiring Atomic Emission Spectrometry (ICP-AES) for study of heavy metals impacts on plants and animals body to understand the ecology of reservoirs Ortega, (2002) [9].

Results and Discussion

In the present investigation Iron, Copper and Manganese were determining from the Vishnupuri and Barul reservoir at Nanded district. In the present investigation the Iron, Copper and Manganese ranges between 0.235 to 0.530 mg/l, 0.0240 to 0.0502 mg/l and 0.019 to 0.052 mg/l at Vishnupuri reservoir respectively and in Barul reservoir Iron, Copper and Manganese ranges between 0.203 to 0.543 mg/l, 0.0239 to 0.0557 mg/l and 0.20 to 0.47 mg/l respectively. The analysis of the heavy metals from Vishnupuri reservoir and Barul reservoir are represented in Table no. 1 and 2. Graphically represented in figure No. 1 and 2 respectively.

In the present investigation the Iron ranges between 0.235 to 0.530 mg/l at vishnupuri reservoir and 0.230 to 0.543 mg/l in Barul reservoir. The maximum concentraction of Iron in the month of February and minimum in the month of August at Vishnupuri reservoir and the minimum value recorded in the month of August and maximum value in the month of October in the Barul reservoir. Adefemi and Awokunmi (2010) [1] studied on the determination of physic-chemical parameters and heavy metals in water samples from Itaogbolu area of Ondo State Nigeria and reported that the fe was found in all the water samples between 0.1 to 5.3 mg/l with an average value of 0.71 to 0.22 mg/l. Asaolu SS, Olaofe O. (2004) observed that the highest concentration 5.3 mg/l Ona River compared with the values in wells is expected because it has been reported that iron occurs at high concentration in Nigeria. But the present investigation the minimum quantity of fe is found it may be due to the low content of the iron in surrounding soil. Sukhdev Kundu (2012) [12] recorded the concentration of fe varied from 0.274 to 1.989 ppm in the selected stretch of the river. He stated that the high concentration of fe in the water imports a bitter taste and strains the cloths if used. Lokhande M.V. (2014) [6] studied on the determination of heavy metals from Godavari river water at Nanded Maharashtra, India and reported that the fe ranges between 0.0254 to 0.0537 mg/l at site I, 0.254 to 0.478 mg/l at site II and 0.233 to 0.465 mg/l at site III respectively. The average range of fe in Godavari river water ranges from 0.233 to 0.537 mg/l. The minimum value of fe recorded in the month of August and maximum value in the month of February. The above workers mentioned the results are similar to the present investigation. In the present investigation the Copper ranges between 0.0240 to 0.0502 mg/l at vishnupuri reservoir and 0.0239 to 0.0557 mg/l in Barul reservoir. The maximum concentration of Copper in the month of September and minimum in the month of January, at Vishnupuri reservoir and the minimum value recorded in the month of February and maximum value in the month of August in the Barul reservoir. Adefemi and Awokanmi (2007) studied on the determination of physicchemical parameters and heavy metals in water samples from Itaogbolu area of Ondo State Nigeria and reported that the concentration of copper (0.18 mg/l). This could be attributed to geological distribution of minerals that vary from location of sited. In the present study similar results were found but the concentration of copper is very low. The similar variation reported in sediment of major dams in Ekiti state. Lokhande M.V. (2014) [6] studied on the determination of heavy metals from Godavari river water at Nanded Maharashtra, India and reported that the Copper ranges between 0.0248 to 0.0550 mg/l at site I, 0.0249 to 0.0599 mg/l at site II and 0.0249 to 0.0567 mg/l at site III respectively.

In the present investigation the Manganese ranges between 0.019 to 0.052 mg/l at vishnupuri reservoir and 0.020 to 0.047 mg/l in Barul reservoir. The maximum concentraction of Manganese in the month of September and minimum in the month of January at Vishnupuri reservoir and the minimum value recorded in the month of February and maximum value in the month of August in the Barul reservoir. Akan *et al*. (2010) [2] studied on the heavy metals in sediments from river Ngada, Nigeria of Manganese (243.0 ug/g) was detected in points. Lokhande M.V. (2014) [6] studied on the determination of heavy metals from Godavari river water at Nanded Maharashtra, India and reported that the Manganese ranges ranges from 0.021 to 0.055 mg/l at site I, 0.020 to 0.050 mg/l at site II and 0.022 to 0.051 mg/l at site III respectively. The average range of Mn in Godavari river water ranges from 0.020 to 0.055 mg/l. The minimum concentrations of Mn are found in the month of January and maximum in the month of September. In the present study the Mn was found in low concentration when compared with above results. The concentration of Mn in Vishnupuri and Barul reservoir might be due to the disposal of solid waste from residential area which might contain levels of the metals. Tesfamariam, *et al*. (2016) [13] Studied on assessment of heavy metal status of sediment and water in Mainefhi and Toker drinking-water reservoirs of Asmara City, Eritrea the concentration levels were Cu 0.004 mg/l, Fe 0.242 mg/l, Mn 0.065 mg/l for Mainefhi reservoir and Cu 0.011 mg/l, Fe 0.165 mg/l, Mn 0.096 mg/l for Toker reservoir. Cadmium (Cd) and lead (Pb) were not detected in the water samples of both reservoirs. Ndeda, L. A and Manohar, S (2014) [8] studied on determination of Heavy Metals in Nairobi Dam Water, (Kenya) dam's water showed that higher concentrations of Cu, were in the dry season with mean values of 4.90 as compared to the wet season mean values of 2.99mg/L. This was due to increase in temperature and high rate of evaporation during the dry season, resulting to high concentrations of these heavy metals in the dam water. The rainy (wet) season caused a dilution factor in the water body;

therefore, low concentrations of these heavy metals were recorded in the dam's water.

Table 1: Heavy metal concentration of vishnupuri reservoir at Nanded

Months	Iron (mg/l)	Cu (mg/l)	Mn (mg/l)
June 2016	0.252	0.0240	0.031
July	0.242	0.0290	0.029
August	0.235	0.0309	0.051
September	0.345	0.0354	0.052
October	0.352	0.0502	0.049
November	0.440	0.0451	0.040
December	0.445	0.0325	0.024
January 2017	0.446	0.0325	0.019
February	0.530	0.0291	0.024
March	0.409	0.0292	0.031
April	0.455	0.0392	0.035
May	0.419	0.0248	0.034

Table 2: Heavy metal concentration of Barul reservoir at Nanded district

Months	Iron (mg/l)	Cu (mg/l)	Mn (mg/l)
June 2016	0.263	0.0256	0.024
July	0.278	0.0299	0.028
August	0.203	0.0326	0.044
September	0.256	0.0382	0.047
October	0.315	0.0557	0.043
November	0.408	0.0465	0.034
December	0.424	0.0360	0.021
January 2017	0.437	0.0280	0.017
February	0.543	0.0280	0.020
March	0.445	0.0256	0.042
April	0.375	0.0239	0.030
May	0.369	0.0250	0.028

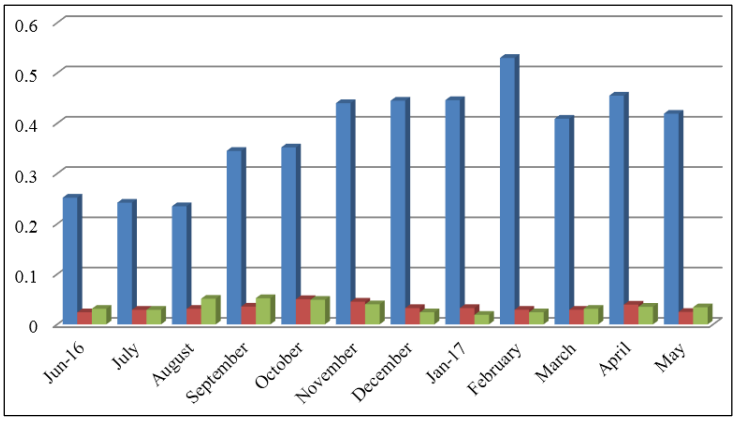

Fig 1: Heavy metal concentration of vishnupuri reservoir at Nanded

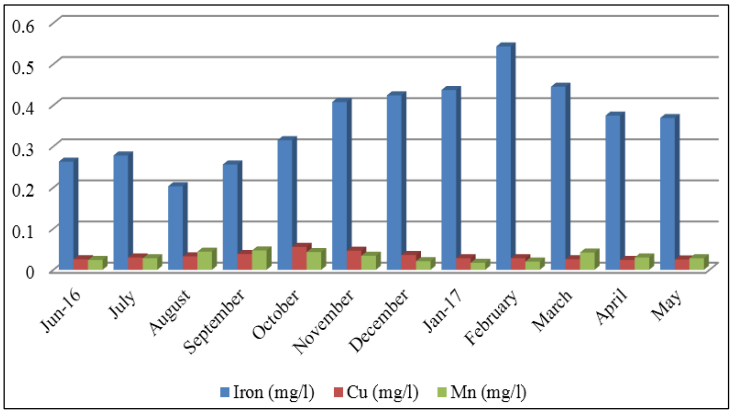

Fig 2: Heavy metal concenmtraction in Barul reservoir

Conclusion

The concentraction of heavy metals in the vishnupuri reservoir exhibiting the following order Mn > Cu > Fe and in the Barul reservoir Mn > Cu > Fe. The srudy rrevealed that the Barul reservoir water content the high amount of Copper and fe in the Vishnupuri rreservoir. The present study provides the information of the concentracdtion of these heavy metals may be beneficial or may not be affected to the aquatic organisms. The probable source of heavy metal in vishnupuri reservoir may be the recreational activities by pilgrims and domestic swage, agricultural surfaces run off water.

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