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Studies on Manganese Concentration Evaluation from Surface Water of Manar Reservoir

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KEYWORDS

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ABSTRACT:

Manganese can be found in a variety of surface and underground water sources, serving as a vital trace metal for all living organisms. Nevertheless, excessive concentrations of manganese can result in adverse health effects on ecosystems. To determine the ecological status of a water source, it is crucial to assess its manganese levels.

Water samples were gathered from the Manar reservoir situated near Barul village in Kandhar taluka of Nanded district, Maharashtra, India, for the purpose of analyzing manganese content. Specifically, three sampling stations were chosen for the current study. The study was conducted between January 2018 and December 2018, and the samples were collected and analyzed on a regular basis in the laboratory. It is noteworthy that the majority of the manganese values obtained from all three sampling sites were found to be within the permissible limit during the present investigation.

Introduction

Water is an integral part of the earth for all living organisms. However, human activities such as industrialization, urbanization, and development have led to the pollution of water resources. Freshwater, especially surface water, is important for various uses, including domestic, agricultural, and industrial activities, as well as drinking. The growth of human civilization has been centered around water resources. Additionally, the quality of freshwater affects the biodiversity of the ecosystem. Different types of water resources, including rivers, lakes, ponds, and groundwater, are beneficial to living systems on the planet (Bhagde *et al.,* 2016).

Water is a critical resource for all living organisms, and its quality is particularly important for humans due to its impact on societal well-being (Sinha and Paul, 2013).

Drinking water and irrigation that contain high levels of trace elements pose a challenge because of the potential negative effects they can have on the health of living organisms and agricultural sustainability (McArthur *et al.,* 2012).

Manganese can be found in different ground and surface water sources, as well as in soil that can disintegrate into water. However, in some locations, human activities are causing the contamination of manganese in the water (WHO, 2011).

Manganese is a critical micronutrient that is necessary for the proper functioning of a wide array of enzymatic proteins, including arginase and glutamine synthase (Horning *et al.,* 2015).

The buildup of an excessive amount of manganese in various parts of the body, particularly the brain, poses a significant environmental challenge due to its toxic effects on the nervous system (Chen *et al.,* 2018)

Increasing manganese consumption can lead to manganism, a neurodegenerative disorder (Avila *et al.,* 2013)

Typically, it is crucial for water meant for daily human consumption to be devoid of excess metals. The current

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study's objective is to measure the amount of manganese ions present in the Manar reservoir. To accomplish this, three different sampling locations were selected for analysis of manganese in the Manar reservoir.

Study area

In this study, three distinct sampling sites were chosen for the investigation of manganese levels through the spectrophotometric method at the Manar reservoir in Nanded district, Maharashtra. This freshwater reservoir, which houses a diverse array of aquatic plants and animals, serves as a breeding ground and is known for its biological richness. Constructed primarily for the purpose of providing water for irrigation, small-scale fishing, and other local needs, it is now recognized as one of the most biologically diverse lakes in the region. Water samples were collected from the Manar reservoir, selected sites were as S_1, S_2 and S_3 **(S= Site).**

Fig 1: Manar Reservoir view near Barul village of Kandhar Taluka, Nanded, Maharashtra.

Material and Methods

The current study aims to analyze the levels of manganese and other elements in the Manar Reservoir. Specifically, water samples were collected from three distinct locations within the dam, namely S1, S2, and S3. The analysis of manganese levels in various water samples was conducted in the laboratory using the persulfate method, which involved the application of a spectrophotometer at 545 nm. Three different locations were chosen to obtain water samples. These water samples were collected between January 2018 and December 2018. The levels of manganese in the collected water samples were compared against the BIS (2012) standard, which is commonly utilized.

Results and Discussion

Table 1 depicted the Manganese metal concentration findings. During this study, the S1 site exhibited the lowest Manganese content of 0.076 mg/L in July and October 2018, as well as the highest concentration of 0.130 mg/L in March and April 2018. On the other hand, the S2 site had a minimum Mn level of 0.073 mg/L in October 2018 and a maximum level of 0.140 mg/L in March and April 2018. The lowest amount of Manganese observed at the S3 site was 0.086 mg/L in August 2018, while the highest level was 0.153 mg/L in March 2018.

Table No.1. The Manganese content in (mg/L) from Manar reservoir during January 2018 to December 2018.

Month and year	Site (S_1)	Site (S_2)	Site (S_3)
January 2018	0.117	0.123	0.126
February 2018	0.120	0.126	0.136
March 2018	**0.130**	**0.140**	**0.153**
April 2018	**0.130**	**0.140**	0.150
May2018	0.126	0.136	0.140
June 2018	0.123	0.126	0.140
July 2018	**0.076**	0.090	0.093
August 2018	0.080	0.086	**0.086**
September 2018	0.083	0.093	0.106
October 2018	**0.076**	**0.073**	0.100
November 2018	0.114	0.114	0.117
December 2018	0.117	0.120	0.126

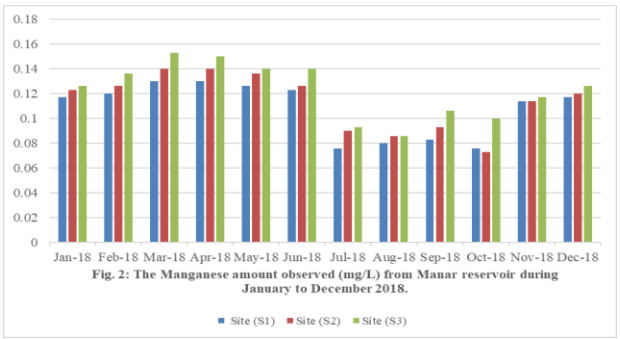

Fig. 2: The Manganese amount observed (mg/L) from Manar reservoir during January to December 2018.

According to the acceptable limit set by the BIS in 2012, the values of manganese observed at all sites of the reservoir were found to be within the permissible range.

Kar *et al.*, (2008) investigated the average manganese concentration in water samples collected from the Ganga River between 2004 and 2005, which ranged from 0.085 to

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0.712 ppm. They reported that the lowest manganese content was found in winter and the highest in monsoon.

Keke *et al.*, (2015) , the manganese levels in the surface water of the Kaduna River at all selected sites ranged from 0.03 to 0.70 mg/L. The lowest value was recorded in June 2015, while the highest value was observed in August 2015.

Lolage and Bhosle, (2016) carried out a research investigation into the seasonal changes in manganese levels in the Isapur reservoir. Their findings showed that the minimum manganese concentration was 0.06 mg/L, while the maximum concentration reached 0.167 mg/L.

Conclusions

In our current study, we found that all the manganese values obtained from the three sampling sites fell within the acceptable limit. Our overall findings suggest that the highest levels of manganese may be attributed to agricultural practices, water runoff, and natural weathering processes near the Manar reservoir.

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References

1 Avila, D. S., Puntel, R. L., & Aschner, M. (2013). Manganese in health and disease. *Met. Ions Life Sci. 13* 199–227.

2 Bhagde, R., Suryavanshi, A., Khan, S., & Dama, L. B. (2016). Study on physico-chemical parameters and faunal diversity of Aadhala River in Ahmednagar district of Maharashtra state, India. *Trends in Life Sciences*, *5*(2), 6-11.

3 Chen, P., Bornhorst, J., & Aschner, M. (2018). Manganese metabolism in humans. *Frontiers In Bioscience, Landmark*, *23*, 1655-1679.

4 Horning, K. J., Caito, S. W., Tipps, K. G., Bowman, A. B., and Aschner, M. (2015). Manganese Is Essential for Neuronal Health. *Annual review of nutrition*, 35, pp 71-108. Indian Standard Drinking Water-Specification IS 10500: 2012, Second Revision, Bureau of Indian Standards Manak Bhavan, 9 Bahadur Shah Zafar Marg New Delhi 110002

5 Irrigation Status Report (ISR) (2018-19), Report from Executive Engineering, Nanded Irrigation Division (S), Nanded. Maharashtra State, India.

6 Kar, D., Sur, P., Mandal, S. K., Saha, T., & Kole, R. K. (2008). Assessment of heavy metal pollution in surface water. *International Journal of Environmental Science & Technology*, *5*(1), 119-124.

7 Keke, U. N., Arimoro, F. O., Ayanwale, A. V., & Aliyu, S. M. (2015). Physicochemical parameters and heavy metals content of surface water in downstream Kaduna River, Zungeru, Niger state, Nigeria. *Applied science research Journal*, *3*(2), 46-57.

8 Lolage Y.P. & Bosale A.B. (2016). Seasonal Variation of Manganese in The Water and Sediment of Isapur Reservoir, Maharashtra. *Journal of Ecotoxicology & Environmental Monitoring*, 26(1) 16-24.

9 Manivasakam N & Singh S. K. (2005). Physico-chemical examination of water sewage and industrial effluents, Pragati Prakashan, Meerut, 5th edition, pp 1-247.

10 McArthur, J. M., Sikdar, P. K., Nath, B., Grassineau, N., Marshall, J. D., & Banerjee, D. M. (2012). Sedimentological control on Mn, and other trace elements, in groundwater of the Bengal Delta. *Environmental science & technology*, *46*, 669-676.

11 Sinha, S. N., & Paul, D. (2013). Impact of sewage water on seed germination and vigour index of *Cicer arietinum L*. and *Pisum sativum L*. *International Journal of Food, Agriculture and Veterinary Sciences*, *3*(3), 19-26.

12 World Health Organization. (2011). Manganese in drinking-water: background document for development of WHO guidelines for drinking-water quality (No.WHO/SDE/WSH/03.04/104 /Rev/1). World Health Organization.