International Journal of Engineering Research and Science & Technology

IJERST

International Journal of Engineering Research and Science & Technology

www.ijerst.org

ISSN : 2319-5991

Vol. 19 No. 2 (2023)

ijerst.editor@gmail.com

editor@ijerst.com

International Journal of Engineering Research and Science & Technology

ISSN 2319-5991 www.ijerst.com
Vol. 19, No. 2, 2023

Research Paper

Seasonal changes in some physico-chemical parameters and evaluation of water quality for drinking at Wadadha Dam Nagpur (M.S.)

Rahul G. Gudhe[1], Kishor G. Patil[2], Sunil Shriram Chaudhari[3], and Prashant P. Ingle[4]

[1]Department of Zoology, Government Institute of Science, Nagpur – 440001
[2]Department of Zoology, Government Vidarbha Institute of Science and Humanities, Amravati – 444604.
[3]Mohsinbhai Zaweri Mahavidyalaya, Desaiganj (Wadsa) Dist- Gadchiroli 441207
[4]Department of Zoology, Saibaba Arts and Science College, Parseoni, Nagpur – 441110
Email Id: rahul.gudhe13@gmail.com

Abstract

Few lakes are present in urban areas of Nagpur city and are polluted because of many human activities. Current study was done at Wadadha Dam, Nagpur (M.S.) that is situated 27 km outside of the city. This lake is used basically to irrigate the surrounding agricultural fields. For two years, from February 2015 till January 2017, the present study was done. Spots for the collection of data were identified and every month the readings were noted. Five physico-chemical parameters viz. Biochemical oxygen demand, dissolved oxygen, temperature, pH and free carbon dioxide were considered. To record their readings, standard methods were used. Bureau of Indian Standards marks were used to compare the data obtained. It was observed that the considered parameters were within normal range, and hence lake water might be safe for drinking accordingly.

Keywords: physico-chemical parameters, pH, temperature, dissolved oxygen, free carbon dioxide, biochemical oxygen demand, potability

Introduction

Few lakes are present in Nagpur city's urban area. But most of them lost their potability because of human activities for eg. sewage influx, immersion of idols as a religious customs[1]. As many reporters [2],[3],[4] reported pollution in these lakes and physico-chemical parameters they chose were beyond the permissible range to be safe for drinking water [5]. Human activities makes water in these lakes unsafe to drink [6]. Since these lakes are inside urban area and human activities alter their physico-chemical nature, this study was done to report whether lakes in rural areas are polluted and also to report the potability accordingly. Out of such lakes, Wadadha lake was selected. As observed earlier to begin this study, the rigorous human activities were not seen at the lake.

Materials and methods

Wadadha lake is 27 km outside of Nagpur city (M.S.), next to Wadadha village. It's coordinates are 20.58'19.8"N and 79°07'36.5"E. From February 2015 to January 2017, this study was done. To obtain true values of the selected parameters must be applicable to whole lake, four accessible spots were selected. Five physico-chemical parameters viz. Biochemical oxygen demand (BOD), Dissolved oxygen (DO), Temperature, pH and free carbon dioxide were selected. Every month, the readings were noted on the spot itself from samples, from 10 am to 12 am. Standard protocols of American Water Works Association [7] were used to note the readings. 5 day BOD Test was used to obtain BOD. *Hanna Instruments Portable DO/BOD Meter HI98193* recorded the DO values and even titration method was done, simultaneously. *Horiba*

Scientific Compact pH Meter B-712 recorded the pH values. Titrometric method was used to record free CO_2 values. For all the arrangement of readings and their calculations *Libre Office Calc* was used in *Linux, Ubuntu 14.04.5 LTS version*. Seasonal mean values, standard deviation (±), standard errors (±) were obtained and for convenience they were rounded off to two decimal places.

Results and discussion

1. **Temperature** (ºC) : Temperature was minimum in winter and maximum in summer. It alters the mixing of carbon dioxide and DO content in lake water [9]. Temperature, in this study, was seen to influence free CO_2 and DO.

2. **pH** : According to the standards of BIS-2012 for safe drinking water, pH of the lake should be between 6.5-8.5. In present study, pH was within that normal range. pH of the lake water decides if the lake is alkaline. In current study, the lake was found alkaline. pH reached minimum in summer and maximum in winter. Some reports [8],[9] on other lakes show similar trends in seasonal variations.

4. **DO** (mg/L) : Amount of DO was maximum in winter and minimum in summer and was within the required range to support life in water. High temperature in summer reduces the productivity of lake, hence DO was found lowered in summer. The influence of temperature on DO was also seen, as in winter, DO was maximum and temperature was minimum. Similar reposts [10],[11] were given in other lakes. Also, DO and pH were minimum in summer, and were maximum in winter, showing the behaviour of DO and pH with each other.

5. **BOD** (mg/L) : As, in summer, the amount of BOD was maximum and DO was minimum, and in winter, BOD was minimum and DO was maximum, this tells that the relationship between DO and BOD is negative. Such condition on other lake too was reported earlier [9].

3. **Free CO_2** (mg/L) : The amount of free CO_2 was found to be minimum in winter and maximum in summer. Since pH of the lake is minimum in summer and maximum in winter, it was found to be in contrast to the amounts of free CO_2. Similar observations were earlier [9] recorded on other lakes.

Conclusion

High DO and low BOD of Wadadha lake shows that the water quality is good. pH is supportive to the life in water and is within the standard range. Hence, it can be said from the above observations that water might be safe for drinking.

Acknowledgement

Authors want to thank Mr. Umesh D. Gajbhiye, Ms. Natasha S. Ramteke and Mr. Sanjay Nagarkar for their moral support in tough times, and also to Ms. Asmita A. Kanekar for her technical and moral support.

References

1) Surface water (lakes) quality assessment in Nagpur city (India) based on Water Quality Index (WQI): P.J. Puri, M.K.N. Yenkie, S.P. Sangal, N.V. Gandhare, G.B. Sarote, D.B. Dhanorkar, Rasayan J. Chem., Vol. 4, No. 1 (2011), 43-48.

2) Study and interpretation of physicho-chemical characteristics of lake water quality in Nagpur city (India) : P.J. Puri, M.K.N. Yenkie, D.G. Battalwar, N.V. Gandhare, and D.B. Dhanorkar, Rasayan J. Chem., Vol. 3, No. 4 (2010), 800-810.

3) Zooplankton fauna assessment of Naik lake of Nagpur city (M.S.) India: S.R. Sitre, Onl. Int. Interdiscipl. Res. J., Vol. 4, Issue-2 (Mar-Apr 2014), 118-123.

4) Phytoplankton biodiversity inlakes of Nagpur city: a bio-indicator of water quality : M.D. Giripunje, A.B. Fulke, P. Meshram, Int. J. of Life Sci., Special issue A2 (October 2014), 159-162.

5) Studies on the physico-chemical status of two water bodies at Nagpur city under anthropogenic influences: M.P. Meshram, K.J. Cherian, S.S. Bodkhe, Int. J. of Res. in Biosci. September 2014, Vol. II, Issue-3 (2014), 130-144.

6) Studies on the ecology and trophic status of an urban lake at Nagpur city, India: S.R. Verma, P.R. Chaudhari, R.K. Singh, S.R. Wate, Rasayan J. Chem., Vol. 4 (2011), 652-659.

7) Standard methods for the examination of water and wastewater (1999): 22nd edition, American Water Works Association (AWWA).

8) Water quality of Nadimi Lake, Hyderabad, Andhra Pradesh, India: O.K. Ruth, Johnson M.E.C., Ind. J. of Aq. Biol., Vol. 27(1) (2013), 48-50.

9) Seasonal variation in physicho-chemical characteristics of Nirmal lake, Vasai, Dist.-Thane, Maharashtra.(India). : R.N. Jadhav, M.R. Pimpliskar, S. Handa, IOSR J. of Pharm. and Biol. Sci., Vol. 8, Issue-6 (Nov-Dec 2013), 48-51.

10) Physicochemical characteristics of Kunigal lake in Tumkur dist, Karnataka: T.P. Naik, K.V. Ajayan, G.H. Lokesh, Int.J.Chem.Sci. 10(2) (2012), 655-663.

11) Some physico-chemical aspects of Bhorpada lake of Thane dist, Maharashtra: A. Gupte, N. Sheikh, S. Yeragi, Proceedings of national level conference on impact of urbanization on lake ecosystem causes, conseuences and remedial measures, 2009, 11-15.

Wadadha Dam sampling sites

International Journal of Engineering Research and Science & Technology

Table no. 1 : Seasonal changes in physico-chemical parameters at Wadadha Dam

SN	Parameter	Summer			Monsoon			Winter		
		Mean	Std. Dev.	Std. Err.	Mean	Std. Dev.	Std. Err.	Mean	Std. Dev.	Std. Err.
1	Temp	**28.68**	3.24	1.62	**28.29**	1.22	0.61	**24.76**	1.7	0.85
2	DO	**6.68**	0.54	0.27	**6.67**	0.24	0.12	**7.47**	0.16	0.08
3	BOD	**5.79**	0.99	0.49	**4.44**	0.54	0.27	**3.09**	0.18	0.09
4	pH	**7.83**	0.05	0.03	**7.93**	0.05	0.03	**8.13**	0.09	0.05
5	CO2	**1.73**	0.42	0.21	**1.59**	0.2	0.1	**1.02**	0.18	0.09

Fig. no. 1: Seasonal changes in physico-chemical parameters at Wadadha Dam.