



A study of seasonal fluctuations of few physicochemical parameters and accordingly the potability of water in Matkazari Dam, Nagpur (M.S.)

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Abstract

Maximum lakes of urban areas of Nagpur city (M.S., India) are polluted due to many anthropogenic activities. The present study was conducted at Matkazari Dam, Nagpur (M.S.) which is located around 27 km from centre of the city. The lake has been used mainly for irrigation purpose. The study was conducted for two years, between February 2015 to January 2017. Four spots were chosen and the readings were recorded on the spot itself once in a month. Standard methods were used to record few physicochemical parameters viz. Temperature, Dissolved oxygen, Biochemical oxygen demand, free carbon dioxide and pH, and the recorded values were compared with Bureau of Indian Standards. It was found that the considered parameters were in normal range and accordingly the lake water might be potable.

Key words : physicochemical parameters, potability, anthropogenic activities, temperature, dissolved oxygen, biochemical oxygen demand, pH, carbon dioxide

Introduction

There are many lakes in urban areas of Nagpur city (M.S.). But maximum of them don't have potable water due to many anthropogenic activities viz. sewage input, idol immersion during religious festivals, etc^[1]. Many researchers^{[2],[3],[4]} have found these lakes to be polluted and that the physicochemical parameters considered by them were not in the permissible limits for potability^[5]. The anthropogenic activities lowered the potability of

water^[6]. Because these lakes are situated inside the city, where the anthropogenic activities are influential, the present study was an influential step to check if the lakes outside of the city are polluted or not, and accordingly to predict whether the water was potable or not. One of these lakes is Matkazarilake. Before commencement of the present study, few anthropogenic activities were observed at Matkazarilake.

Materials and methods

Matkazarilake is situated around 27 km away from centre of the Nagpur city (M.S.) near Matkazari village. It is located at 20.58'12.8"N and 79°08'03.0"E. The study was conducted for two years, between February 2015 to January 2017. Four spots were chosen at the lake in such a way that the readings will represent the true values for the whole lake (Fig. 1). For present study, few physicochemical parameters viz. Temperature, Dissolved oxygen (DO), Biochemical oxygen demand (BOD), free CO₂ and pH were considered. The samples were collected once in a month during 10 am to 12 am, and the readings were recorded on the spot only. Standard methods prescribed by American Water Works Association^[7] were used to record the readings. Biological Oxygen Demand (BOD) was estimated by 5 day BOD Test method. DO was recorded by *Hanna Instruments Portable DO/BOD Meter HI98193* and titration method, both. pH was recorded with *Horiba Scientific Compact pH Meter B-712*. Free CO₂ was estimated by titration. Readings were arranged in and all the calculations were done in *LibreOffice Calc of Ubuntu 14.04.5 LTS version of Linux*. Seasonal average values, standard deviation (\pm) and standard errors (\pm) were obtained (Fig. 2) and were rounded off to two decimal places. Recorded values were compared with *Bureau of Indian Standards (BIS-2012)*.

Results and discussion

1. **Temperature** (°C) : Temperature was found to be maximum in summer and minimum in winter. It plays an important role in carbon dioxide mixing in water and amount of DO in water^[9]. In present study, temperature was found to be influencing DO and free CO₂.
2. **pH** : pH of the lake was found to be in the normal range of the standards given by BIS – 2012 i.e. between 6.5-8.5. pH of the lake decides whether the lake is alkaline or acidic. In present case, pH was maximum in winter and minimum in summer. Hence, the lake water was found to be alkaline. Seasonal fluctuations coincides with the earlier findings^{[8],[9]} on other lakes.
3. **Free CO₂** (mg/L) : The amount of free CO₂ 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 CO₂. Similar observations were earlier^[9] recorded on other lakes.
4. **DO** (mg/L) : DO was found to be minimum in summer and maximum in winter, and the range is supportive to aquatic life forms. Since the temperature is maximum in summer, it interferes with the productivity by aquatic plants and lowers the amount of DO in summer. Also in winter, the temperature was found to be minimum and DO to be maximum, which corroborates the influence of temperature on DO. Similar observations^{[10],[11]} were recorded earlier. Since, in summer, pH and DO were found to be minimum, and in winter, both to be maximum, this shows the relationship between pH and DO.
5. **BOD** (mg/L) : In summer, BOD was found to be maximum and DO to be minimum, while in winter, BOD was found to be minimum and DO to be maximum. This shows the negative relationship between BOD and DO. Similar effect was predicted earlier^[9] on other lake.

Conclusion

Low amount of BOD and high amount of DO reflects the good quality of water. pH was found to be in normal range and supportive to the aquatic life forms. Hence we conclude that the lake water might be potable with respect to these physicochemical parameters.

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Fig. 1: Matkazari Dam sampling spots



Fig. 2: Seasonal changes in physico-chemical parameters at Matkazari Dam

SN	Parameter	Summer		Monsoon		Winter	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1	Temp	28.76	3.24	28.25	0.99	24.81	1.81
2	DO	6.69	0.52	6.73	0.26	7.48	0.19
3	BOD	5.81	0.95	4.4	0.42	3.11	0.27
4	pH	7.79	0.04	7.97	0.07	8.12	0.04
5	CO ₂	1.72	0.41	1.58	0.18	1	0.21

Fig. 3 : Seasonal changes in physico-chemical parameters at Matkazari Dam

