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Study of Physiochemical Parameters of Small Lakes in Sangamner, Ahmednagar District of Maharashtra State, India

RUPENDRA VINAYAK BHAGDE¹, DNYANESHWAR RAMRAO DESHMUKH², SHREYAS SAMBHAJIRAO PANSAMBAL³ and MANISH RAMESH BHOYE^{3*}

¹Department of Zoology, S. N. Arts, D. J. M. Commerce and B. N. S. Science College, Sangamner, Dist. Ahmednagar, M.S., India.

²Department of Zoology, Pratishthan Mahavidyalay, Paithan, Dist. Aurangabad, M.S., India. ³Department of Chemistry, S. N. Arts, D. J. M. Commerce and B. N. S. Science College, Sangamner, Dist. Ahmednagar, M.S., India.

Abstract

Water resources have great importance for the existence of life. Freshwater resources in the plateau area in Sangamner Taluka of Ahmednagar district are limited. Therefore, there is a need of sustainable use of water resources especially lakes. The physicochemical analysis is necessary to know the water quality. This study aimed at the monitoring of water quality for its sustainable use by assessing the physicochemical parameters of small lakes in the plateau region of Sangamner Taluka. In the present study, the water samples were collected from the spots selected for the study in different seasons. The physicochemical parameters viz. temperature, pH, dissolved oxygen, dissolved Carbon dioxide, alkalinity, hardness and T.D.S. were recorded by using standard methods. The dissolved oxygen was found in the range of 5.1 mg/L to 7.9 mg/L. The dissolved Carbon dioxide was in the range of 32 mg/L to 48 mg/L. The alkalinity was in the range of 120 mg/L to 330 mg/L. The temperature was in the range of 21°C to 32°C. The hardness was in the range of 58 mg/L to 140 mg/L. Seasonal variations in the physicochemical parameters were observed at different spots. Observations in the present study have emphasized the need to raise awareness among the people for water conservation and management.

Introduction

Lakes are very useful aquatic resources. Lake water can be used for various purposes such as

agriculture, aquaculture, livestock rearing and for various domestic use also. Review of literature reveals that several workers have carried out the

CONTACT Manish Ramesh Bhoye manishbhoye11@gmail.com Department of Chemistry, S. N. Arts, D. J. M. Commerce and B. N. S. Science College, Sangamner, Dist. Ahmednagar, M.S., India.

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Physicochemical Parameters, Lake Water, Seasonal Variations, Dissolved Oxygen.

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work related to the physicochemical parameters of lakes in relation to various aspects in India and abroad. Water Quality of Pariyej lake in Gujarat was found poor and not safe for human consumption due to the low Water Quality Index.¹ Pollution of lake water occurs as ground water in the area around it is polluted due to the lack of proper sewage and waste disposal practices.² The ecosystem of lake gets damaged severely due to degradation of eutrophication. This may occur due to inappropriate planning of water management.³ Timely monitoring and proper management of water bodies can reduce pollution which can maintain water quality.⁴ Physicochemical factors of the lake water affect the insect community in their vicinity.⁵

Some researchers have carried out work on water quality index of ex-mining ponds, lakes, natural ponds, artificial ponds, pits, wetlands, water quality and pollution index. In water quality monitoring physicochemical parameters are very important. The water quality index gets affected due to atmospheric activities and the presence of heavy metals in lake water.⁶ Water quality index is a useful approach to categorize water quality into different classes like bad and medium.7 Regular monitoring of variation in physicochemical parameters can prevent the source of pollution of the lake and it will also help to maintain the biodiversity and recreation.8 Very few researchers have done the work in Maharashtra and especially in Ahmednagar district. Sewage effluents can cause contamination and eutrophication of lakes. Seasonal limnological investigations can be useful for tracking the water quality.9 Pit lake water quality have the potential of self-improvement and restoration with seasonal variation.¹⁰ The level of dissolved oxygen above the permissible limit along with other physicochemical parameters within the permissible limit indicates the healthy condition of the lake which makes the water quality safe for domestic and agricultural use.¹¹ The inflow of industrial waste and sewage water into the lake water is responsible for water pollution. It can be prohibited by the use of barricades and filters around the lake.¹² Physical, chemical and biological methods can be used for the restoration of lakes and to solve the water crisis.13

The main objective of this study is to find out the water quality of small lakes in the plateau region of Sangamner taluka of Ahmednagar district for its sustainable use. Ahmednagar district especially the plateau area of Sangamner taluka always experiences a scarcity of water. The rural economy of this area depends mainly upon livestock rearing and agriculture. A review of the literature suggests that such type of research work on seasonal variation has not been done on the lakes selected for the present study. It was observed that sustainable use of these lakes is not in practice. Assessing the water quality of small lakes in the study area is the key step for its sustainable use which can be achieved by regular monitoring of its physicochemical parameters. Considering the above mentioned facts, it was necessary to undertake this type of research work in the area selected for the present research work.

Materials and Methods

For the present study, four small lakes of Dhorwadi, Pokhari-Baleshwar, Pimpalgaon Depa and Pemgiri villages (Fig 1) in the Sangamner Taluka of Ahmednagar District of Maharashtra State were selected. Water samples were collected over a period of one year from July 2018 to June 2019 in representative months of the season viz. July in Monsoon season. December in Winter season and April in Summer season between 7 a.m. to 8 a.m. from the lakes selected for study and physicochemical analysis were done. The temperature was recorded with the help of thermometer, pH and T.D.S. were recorded by digital pH meter and T.D.S. meters respectively on the spot. Water samples were collected and dissolved oxygen was fixed by using solutions Winkler A and Winkler B on the spots by using DO bottles. After coming to the laboratory, the dissolved oxygen was estimated by using Winkler's method. Hardness, Alkalinity and dissolved Carbon dioxide were estimated in the laboratory by methods given by APHA.14

Result and Discussion

The results are tabulated in Table-1. The dissolved oxygen was found in the range of 5.1 mg/L to 7.9 mg/L. The minimum was at Dhorwadi in the summer season and the maximum was at Pokhari Baleshwar in the winter season. The dissolved Carbon dioxide was in the range of 32 mg/L to 48 mg/L. The minimum value was at Pemgiri in monsoon season and the maximum value was at Pokhari Baleshwar and Pemgiri in the summer season. The alkalinity was in the range of 120 mg/L

to 330 mg/L. The minimum was at Dhorwadi in the monsoon season and the maximum was at Pokhari Baleshwar in the summer season. The hardness was in the range of 58 mg/L to 140 mg/L. The minimum was at Dhorwadi in monsoon season and the maximum was at Dhorwadi and Pimpalgaon Depa in the summer season. The temperature was in the range of 21°C to 32°C. The minimum temperature was recorded at Pimpalgaon Depa in the winter season and the maximum was at Dhorwadi in the summer season. The T.D.S. was in the range of 170 mg/L to 300 mg/L. The minimum value was at Dhorwadi in the monsoon season. The pH was found in the range of 7.1 to 8.4. The minimum was at Dhorwadi and Pemgiri in monsoon season and maximum at Pimpalgaon Depa in the summer season. Seasonal variation in physicochemical parameters in different seasons at different spots are graphically represented in Fig 2. From the graphical representation, we observed that water temperature and dissolved oxygen showed an inverse relationship with each other.



Fig 1: Map of India, Maharashtra and Sangamner showing Study Sites

Season	Collection site	DO mg/L	CO ₂ mg/L	Alkalinity mg/L	Hardness mg/L	Temp °C	TDS mg/L	рН
Monsoon	Dhorwadi	6.3	33	160	58	30	170	7.1
	Pokhari Baleshwar	6.5	36	120	68	29	180	7.3
	Pimpalgaon Depa	6.8	34	140	70	28	190	7.2
	Pemgiri	6.7	32	150	60	28	190	7.1
Winter	Dhorwadi	7.4	38	180	85	24	210	7.6
	Pokhari Baleshwar	7.9	42	188	100	22	220	7.4
	Pimpalgaon Depa	6.9	39	190	110	21	210	7.7
	Pemgiri	7.1	42	200	90	24	200	7.8
Summer	Dhorwadi	5.1	50	240	140	32	240	8.1
	Pokhari Baleshwar	5.2	48	330	130	31	300	8.2
	Pimpalgaon Depa	5.6	44	280	140	30	280	8.4
	Pemgiri	5.8	48	300	120	30	270	8.2

Table 1: Result of Physico-chemical parameters of lake water with seasonal variation

DO- Dissolved Oxygen, TDS- Total Dissolved Solids

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Carbon Dioxide 60 50 48 48 50 38 42 42 39 (T/Sul) 30 36 34 33 32 0⁶ 20 10 0 Pimpalgaon Depa Dhorwadi Pokhari Pemgiri Baleshwar ■Rainy ■Winter ■Summer



■Rainy ■Winter ■Summer







Fig 2: Graphs of physicochemical parameters with seasonal variations

From the literature study, it is also found that minimum temperature was in the winter season and the maximum temperature was in the summer season. This is due to the effect of atmospheric temperature on water temperature. An adverse relationship between the dissolved oxygen and the water temperature was observed.15 Water quality of the lake can be improved and maintained by pitching and fencing the lake which prohibits the anthropogenic activities along the lake.16 Investigations and strict vigilance of lakes are required to prevent heavy metal pollution and to maintain the water quality of the lake.¹⁷ Discharge of agricultural and domestic wastes influence the lake water quality.¹⁸ Physicochemical parameters of lake water within the permissible limit can support the stability and quality of the lake water ecosystem which promotes primary productivity.19 Many manmade activities cause water pollution which creates problems in aquatic ecosystems by damaging them.²⁰ Global warming affects the climatic conditions which affect the aquatic organisms in the ecosystems mainly due to temperature variation.²¹ Researchers observed that the water quality of lake was better in the winter season and degraded in monsoon season.22

Conclusion

In the present study, seasonal variation in the physicochemical parameters was observed at

different spots. As the pH of the water was alkaline and dissolved oxygen was found in the permissible limit, we suggest that water quality can be maintained by sustainable use of the lake water. This can be achieved by regular monitoring, proper planning and management for sustainable use of lake water. Also, near Pemgiri lake famous largest banyan tree in Maharashtra is located. Temple of goddess Pemadevi is on the historical Pemgiri fort and at Pokhri-Baleshwar lake temple of Lord Shiva is on the top of the hill. Both these lakes can be utilized for recreational purposes. These two spots have great potential to get developed as tourist spots. This can boost the economy of this semiarid plateau area of Ahmednagar district.

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Conflict of Interest

The authors do not have any conflict of interest.

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