

# Seasonal Variation in Physico-Chemical Parameters of Bhagyanagar Lake in Khanapur Tehsil, District Sangli, Maharashtra, India

Punam Pratap Patil\*<sup>1</sup> and Gajanan Kashinath Sontakke<sup>2</sup>

<sup>1-2</sup> Department of Zoology, Vivekananda College, (Empowered Autonomous), Kolhapur - 416 003, Maharashtra, India

Received: 20 Oct 2023; Revised accepted: 16 Jan 2024; Published online: 05 Feb 2024

## Abstract

The purpose of the present study was to see a seasonal variation of physico-chemical parameters in water samples collected from Bhagyanagar Lake located in Sangli District. This study was carried out from February 2022 to January 2023. The water parameters such as pH, electrical conductivity, total hardness, total dissolved solids, total alkalinity, calcium, magnesium, phosphate, sulphate and nitrate were measured and analyzed by standard methods. The present study indicates that the mean seasonal values of phosphate ( $1.145 \pm 0.097$ ), sulphate ( $15.72 \pm 10.75$ ), and nitrate ( $5.967 \pm 0.785$ ) are within the permissible limits of Indian standard values. This result revealed that the water in Bhagyanagar Lake is suitable for drinking agriculture and aquaculture purposes.

**Key words:** Bhagyanagar Lake, Physico-chemical parameters, Seasonal values

Water supports the life on earth which is flora and fauna. Nowadays growing population dependent is on freshwater bodies for drinking water and domestic use [2]. Due to excessive human interference in water bodies that face problems, there is a need to have continuous monitoring of the water parameters and to make an action to conserve them is essential. The components of water present an optimum level which is essential to the growth of plants and animals referred to as water quality [9]. With the change in season, the environment changes and that affects water quality health adversely or beneficially. The health of lakes and their biological diversity related to health of almost every component of the ecosystem. Continuous monitoring of the physical and chemical parameters of water is important to conserve and defend the natural ecosystem. Certain parameters such as pH, Total Dissolved Solids, Total Hardness, Calcium, Magnesium, Electrical Conductivity, Sulphate, Phosphate and Nitrate, are necessary for the understanding of flora and fauna presence and distribution with time [12]. The continuous monitoring is beneficial to protect habitat stretches and also for the planning of conservation activities [18].

Bhagyanagar Lake was selected for around a year for physico-chemical study. Different physico-chemical parameters were selected and analyzed by basic statics to see a variation according to seasons during the study period. It is necessary to take initiative steps and efforts to restore, protect and conserve the lakes. The objective of the current investigation is to know the changes in parameters according to changes in season and their impact on aquatic and social life.

The selected area for the present study is located in Khanapur Tehsil, District Sangli (MH). Bhagyanagar Lake was selected for sample collection and subsequent analysis for year from February 2022 to January 2023. It is situated 12km away from sub-headquarters Vita and 60 km away from district headquarter Sangli. The lake is manmade, its depth is around 30 to 35 feet and lake are surrounded by agricultural fields. The co-ordinates are between the latitude  $17^{\circ}21'31''$  N and longitude  $74^{\circ}32'54''$  E. The water from the lake used to irrigation and drinking purposes in nearby villages.



Fig 1 Bhagyanagar lake (Satellite image)



Fig 2 Bhagyanagar lake image

## MATERIALS AND METHODS

### Study area

\*Correspondence to: Punam Pratap Patil, E-mail: patilpunam2603@gmail.com; Tel: +91 9096677042

Citation: Patil PP, Sontakke GK. 2024. Seasonal variation in physico-chemical parameters of Bhagyanagar Lake in Khanapur tehsil, district Sangli, Maharashtra, India. *Res. Jr. Agril. Sci.* 15(1): 211-213.

### Sample collection

The water samples were collected from Bhagyanagar Lake. The collection was done at four sites around the lake in 15-days of intervals for a year in the morning at 6 am to 7 am. Water samples were collected in four different well-rinsed and pre-cleaned plastic bottles with 1 Liter capacity. After collection sample was brought to research laboratory for further analysis of water physical and chemical parameters was done with the help of standard guidelines of the American Public Health Association (APHA, 2017<sup>th</sup>).

## RESULTS AND DISCUSSION

The physico-chemical parameters pH, total hardness, total dissolve solids, total alkalinity, calcium, magnesium, phosphate, sulphate and nitrate were analyzed in water samples taken from Bhagyanagar lake Khanapur Tehsil, District Sangli, Maharashtra, India. The water samples were taken seasonally from four sites of the lake. All parameters were reported in the seasonal mean value of the data with standard deviation in (Table 1).

Table 1 Seasonal record of physico-chemical parameters of Bhagyanagar lake during February 2022 to January 2023

Parameter / Month	Summer	Monsoon	Winter
pH	8.4±0.158	8.42±0.29	8.125±0.192
EC (mS/cm)	0.53±0.254	0.40±0.048	0.445±0.045
TDS (mg/l)	340.2±16.58	254.5±30.63	283±28.27
TH (mg/l)	119±52.47	63±6.670	85.25±5.49
Total alkalinity (mg/l)	150.2±13.42	239.2±27.03	269.5±25.58
Calcium (mg/l)	34.5±4.924	38±2.121	47.5±1.658
Magnesium (mg/l)	28.65±6.620	28.5±2.061	38±3.674
Phosphate (mg/l)	1.145±0.097	0.827±0.150	0.912±0.057
Sulphate (mg/l)	15.72±10.75	9.5±5.488	13.622±0.072
Nitrate (mg/l)	3.572±0.144	4.222±1.071	5.967±0.785

Mean ± Standard deviation

The seasonal mean standard deviation value of pH in the lake water is rises (8.42±0.29) during monsoon and lowers (8.125±0.192) in winter season. The Electrical Conductivity increases (0.53±0.254) in summer and decreases (0.4±0.0448) in monsoon. The value of Total Dissolve Solids highest (340.2±16.58) in summer and lowest (254.5±30.63) in monsoon. The value of Total Hardness is high (119±52.47) in summer and low (63±6.670) in monsoon. Total Alkalinity during the study period increases (269.5±25.58) in winter and decreases (150.2±13.42) in summer. The value of Calcium recorded as high (47.5±1.658) in the winter and lower (34.5±4.924) in summer. Values of magnesium increase (38±3.674) in winter and decrease (28.5±2.061) in monsoon. The value of Phosphate rises (1.145±0.097) in summer and lowers (0.827±0.150) in monsoon. The value of Sulphate is highest (15.72±10.75) in summer and lowest (9.5±5.488) in monsoon. The value of nitrate increases (5.967±0.785) in winter and decreases (3.572±0.144) in summer.

The seasonal mean standard deviation value of pH was recorded high in rainy season and low pH in winter season. The pH is slightly higher due to ions coming with the rainwater runoff in the lake and low pH due to pollution in winter [4]. The value of electrical conductivity increases in summer and decreases in monsoon. This is due to evaporation of water and ions leached out from the lime rock that form a concentrate of ions that is proportional to TDS which has high conductivity. In monsoon rainwater directly mix with the lake water that dilute the water and decreases the conductivity of water [14], [6]. The values of Total dissolved solids increases in summer and decrease in monsoon. Due to high temperature water evaporates and concentrate the dead organic matter of plants and animals in summer and decreases in monsoon due to the rainwater that dilutes the water body [11]. The Total Hardness is low in monsoon and high in summer and winter. These values are higher in summer and winter might be due to evaporation of

water and high concentration of water [12]. Total Alkalinity during the study period rises in winter and lowers down in summer[5]. The value of the Calcium was recorded as highest in winter and lowest in summer. The decrease in calcium concentration in summer is due absorption of calcium by plants and animals for their growth, bone building and shell formation [3]. The value of Magnesium increases in winter and decreases in monsoon. Magnesium is a limiting factor for plants that use in the plants for chlorophyll synthesis [15]. The values of phosphate is highest in summer and lowest in monsoon. The highest phosphate in summer is due to the entry of animal matter in lake water [8]. Sulphate is highest in summer and lowest in monsoon. Sulphate increases in summer due to the decaying of plants and animals and decreases in monsoon due to water dilution [9]. The value of Nitrate is recorded as highest in winter and lowest in summer. Increase in nitrate by the growth of some nitrogen-fixing bacteria and a decrease in Nitrate by oxidation in summer [7].

## CONCLUSION

The present study is essential to test the lake water before for drinking, domestic, agricultural and industrial purpose. Among the all parameters nutrients Phosphate, Sulphate and Nitrate are present in permissible limits. It is essential to investigate the physico-chemical parameters of water before use and to avoid pollution for sustainable ecology and aquatic life. This study provides platform for a future investigation and protection of aquatic life.

### Acknowledgement

The authors are thankful to Chatrapati Shahu Maharaj National Research Training and Human Development Institute, Pune (SARTHI) for granting a Junior Research Fellowship (CSMNRF-2021/2021-22/896).

## LITERATURE CITED

1. APHA. 2017. *Standard Methods for the Examination of Water and Wastewater*. 17<sup>th</sup> Edition, American Health Association, Washington DC.
2. Rohini A, Reddy MP. 2020. Physico-chemical studies on Safilguda lake, Hyderabad. *International Journal of Science and Research* 10(12): 30-31. DOI: 10.21275/SR2111301103.
3. Dev BV, Kumari R, Sushma J. 2021. Physico-chemical parameters: An indicator of water pollution. *Journal of Environmental Research* 5(5): 1-5. <http://doi.org/10.1038/jes.2008.68>.
4. Raj JA, Sevrkodyone SP. 2018. A study on physico-chemical parameters of Urjinkulam pond, Thiruthangal, (Virudhunagar District, Tamil Nadu. *International Journal of Aquaculture and Fishery Science* 4(1): 1-10.
5. Khaiwal R, Ameena, Meenakshi, Rani M, Kaushik A. 2003. Seasonal variations in physico-chemical characteristics of River Yamuna in Haryana and its ecological best-designated use. *Journal of Environmental Monitoring* 5: 419-426.
6. Mendonsa L, Prasad VV. 2019. Comparative ecological analysis of five freshwater lake in and around Mumbai, India. *Journal of Ecology and Natural Resources* 3(5): 1-14. DOI: 10.23880/jenr-16000178.
7. Qureshimatva UM, Maurya RR, Gamit SB, Patel RD, Solanki HA. 2015. Determination of physico-chemical parameters and water quality index of Chandlodia Lake, Ahmedabad, Gujarat, India. *Journal of Environmental and Analytical Toxicology* 5(4): 2-6. Doi: <http://dx.doi.org/10.4172/2161-0525.1000288>
8. Sahni K, Yadav S. 2012. Seasonal variations in physico-chemical parameters of Bharawas pond, Rewari, Haryana. *Asian Journal Experimental Sciences* 26(1): 61-64.
9. Sawant RS, Telave AB. 2009. Seasonal variations in physico-chemical characteristics of four aquatic ecosystems in Gadhinglaj Tehsil of Maharashtra, India. *Nature Environment and Pollution Technology an International Quarterly Scientific Journal* 8(3): 509-514. Doi: 10.4172/216-10525.1000288.
10. Dey S, Botta S, Kallam R, Angadala R, Andugala J. 2021. Seasonal variation in water quality parameters of Gudlavalluru Engineering College Pond. *Current Research in Green and Sustainable Chemistry* 4: 1-15: (100058). <https://doi.org/10.1016/j.crgsc.2021.100058>.
11. Shoba SM, Kumar DS. 2022. Seasonal variation in physicochemical characteristics of the Kalyan Lake. A study. *International Journal of Food and Nutritional Sciences* 11(8): 2173-2177.
12. Shweta S, Aruna M. 2023. Assessment of physicochemical parameters of Manchippa Lake Nizamabad district, Telangana. *International Journal of Scientific Research in Sciences and Technology* 10(3): 696-703.
13. Kumar SA. 2016. Analysis of physicochemical parameters for water quality: A review. *Conference. Biton. At: Chhattisgarh, India* 15(16): 1-15.
14. Verma P, Chandawat D, Gupta U, Solanki H. 2012. Water quality analysis of an organically polluted lake by investigating different physical and chemical parameters. *International Journal of Research in Chemistry and Environment* 2(1): 105-111.
15. Verma PU, Chandawat DK, Solanki HA. 2011. Seasonal variation in physico-chemical and phytoplankton analysis of Kankaria lake. *Life Sciences Leaflets* 19: 842-854.
16. Wakode AA, Ather Q. 2020. Physic-chemical studies on Kagzipura and Mombatta Lake, Aurangabad (Maharashtra). *International Journal for Research in Applied Sciences and Engineering Technology* 8(8): 416-423. Doi: 10.22214/ijraset.2020.32177
17. Yadav P, Yadav VK, Yadav AK, Khare PK. 2013. Physico-chemical characteristics of a fresh water pond of Orai U. P. Central India. *Octa Journal of Biosciences* 1(2): 177-184.