

An ecological assessment of Gundolav Lake Kishangarh, Ajmer (Rajasthan)

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Abstract

Gundolav Lake situated in Kishangarh, Ajmer is an important freshwater ecosystem with unique significance from ecological, cultural and economic point of views. This research assesses the current status of water quality, biodiversity and anthropogenic impacts. The research involved, systematic sampling and analysis of selected physico-chemical parameters such as temperature, pH, TDS, DO, chlorides, nitrate, phosphates and alkalinity. These finding indicate the pollution level in this water body due to swage, agricultural runoff, industrial discharge etc. that is leading to eutrophication and habitat degradation.

Keywords: Anthropogenic impacts, water quality, eutrophication

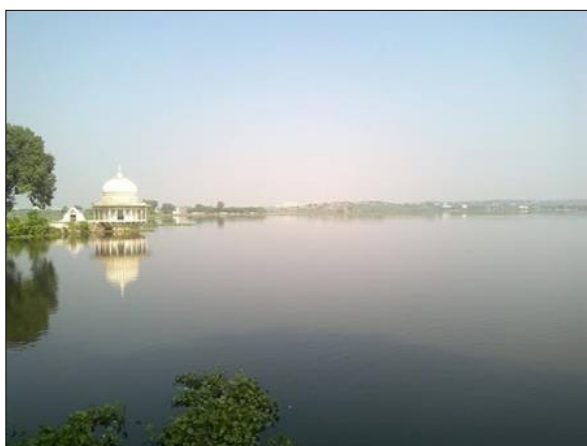
Introduction

The water quality assessment of an aquatic body demonstrates its ecological assessment. This quality is directly affecting the species composition, abundance, productivity, and physiological condition of aquatic organisms (Purohit and Singh, 2020) [1]. Thus, water create an ecological homeostasis between various groups of organisms and their environment (Khanna *et al.* 2012) [2]. Development and irresponsible use of water resources deteriorate river and lake qualities (Sanchez, 2007) [3]. Due to industrialization and development, the world is facing big problem of pollution which directly or indirectly degradates the hydrological environment (Karanth, 1989). The water pollution causes the change of water quality as well as also affects human health and creates imbalance in aquatic ecosystems, economic development, and social prosperity (Verma and Khan, 2015) [5]. For sustainable management it is urgently required to take some step towards appropriate

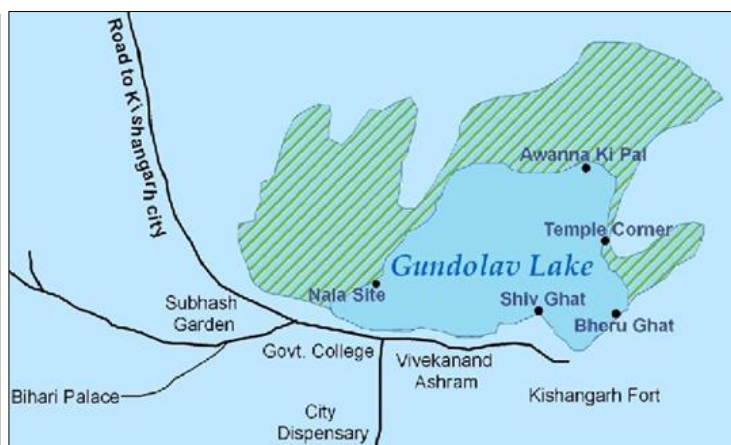
quality management and proper utilisation of the water resources to eliminate water pollution. Thus, this study will act as baseline data which may be helpful in future research on water quality parameters for assessing productivity and prediction of fisheries potential (Bedwal and Mathur, 2015) [6].

Material and Methods

Gundolav Lake is located in Kishangarh and 18 miles far from North West Ajmer, Rajasthan at 26°28' N and 74°52' E. The total catchment area of lake is 13.44 sq. km. and terrain are semi hilly and rocky. It is a man-made lake located just close to Phool Mahal (Sharma and Sharma, 2017) [7]. The water samples for the present study were collected at regular intervals during the study period of July 2023 to June 2024. The samples were collected from selected three sites so that the lake was uniformly covered.



(A) Gundolav lake, Kishangarh



(B) Map of Gundolav lake

For water quality analysis samples were collected in 500 ml plastic bottles and carried to the laboratory for further analysis. Some parameters like dissolved oxygen, temperature, visibility was estimated on the spot and remaining were done in the laboratory. Parameters were analysed according to standard methods described in Trivedi and Goel (1992) [9], APHA (2005) [8], Sharma and Saini (2009) [10].

Result and Discussion

The study of different parameters showed the quality of water which helped to assess ecological features of the reservoir studied.

Water temperature

Water temperature is an important parameter for the metabolic and physiological activities of life processes. It

affects the chemical and biological reaction in water. (Verma and Khan, 2015) [5].

Temperature variations may influence physio-chemical characteristics and the distribution and abundance of aquatic flora and fauna. (Choudhary *et al.*, 2021). The temperature directly affects the solubility of gases in water such as oxygen, carbon dioxide, bicarbonates, and carbonates equilibrium. According to the season, in summer months temperature exhibits maxima and in winter months the temperature was found to be minimum (Dwivedi and Pandey 2002; Mishra *et al.*, 2008; Verma and Khan, 2015) [5]. In the present investigation water temperature varied between 20.80 to 23.45°C, and the average temperature was 22.45°C.

1. pH: pH denotes the H⁺ ion concentration in water which shows the intensity of acidity or alkalinity of water. Generally, the natural waters are alkaline due to the presence of carbonates (Choudhary *et al.*, 2021). The higher value of pH is also caused by discharged sewage (Bedwal and Mathur, 2015) [6]. pH value is also affected in summer due to low level of water and nutrients concentration while pH value may be low in monsoon due to rain water. In the present study average pH was found 8.23 which varied between 7.98 to 8.41.

2. Total dissolved solid (TDS)

Total dissolved solids in natural water indicates dissolved salts in water like carbonates, bicarbonates, sulphates, phosphates, chlorides, nitrates, calcium, potassium etc. The higher value of TDS occurs due to increased anthropogenic activities, stagnation, and concentration of water (Manickam *et al.*, 2014) [12]. The high amount of TDS also influences the osmoregulation. TDS reduces the solubility of gasses in water resulting in such water unsuitable for domestic, industrial and drinking purposes (Choudhary *et al.*, 2014). In the present investigation the average value of TDS was found to be fairly good (668.11 mg/l) which indicates that it is suitable for domestic and industrial uses.

3. Dissolved Oxygen

Dissolved oxygen in water is a very important parameter that affects its physical, chemical, and biological activities of the water; it means it indicates the health of a water body (Edmondson, 1961) [13]. The dissolved oxygen is an index of physical and biological processes going on. Non-polluted surface water is normally saturated with dissolved oxygen (Joharwal *et al.*, 2020) [14]. It also indicates the water body's ability to support desirable aquatic life. The concentration also decreases with increase in the salinity (Verma and Khan, 2015) [5]. In the present observation the average dissolved oxygen found was 5.07 mg/l which varied between 4.68 to 5.28 mg/l.

4. Depth of Visibility

Transparency of water is inversely proportional to turbidity which in turn is directly proportional to the amount of suspended organic and inorganic matter (Rukasana and Srivastava, 2015) [15]. Generally, lake and pond become

turbid due to surface runoff in monsoon which carries so many things from the catchment area to the waterbody.

In the present study the depth of visibility value was found to vary from 44.70 to 64.34 cm.

5. Chloride

Chloride ion concentration is directly related with weathering and leaching of sedimentary rocks, domestic and industrial wastes discharge, municipal influences etc. According to this, its concentration varies in different natural waters. The higher concentration of chloride is an indicator of pollution; it may be due to swage mixing and increased temperature and evaporation of water (Vijayvergia *et al.* 2007, Verma and Khan, 2015) [5, 17]; Umavathi *et al.* 2007) [16]. In the present study the value of chloride fluctuated between 118.81 mg/l to 283.76 mg/l.

6. Nitrates

Nitrates is a necessary nutrient for crop production. In the rainy season it is washed away from farmland into nearby water sources. It is the highest oxidized form of nitrogen and in water it is the source of biological oxidation. Its higher concentration in water is toxic and indicates pollution due to organic waste and domestic sewage (Bedwal and Mathur, 2015) [6]. The excess amount of nitrate creates eutrophic conditions of aquatic sources (Sultan, 2003) [18]. In present investigation the average nitrate was 1.79 mg/l and with the range of 1.06 mg/l to 3.21 mg/l recorded, which indicates the lake moved towards eutrophication.

7. Phosphates-

Phosphorus is a key nutrient for fertility and productivity of the water body. It is an essential element for plant growth and also a basic element in the metabolic reactions of plants and animals. It controls the rapid algal growth and the primary productivity in aquatic habitats. (Choudhary *et al.*, 2021). Higher concentration of phosphates also creates pollution and eutrophic conditions. In the present research, the average phosphate recorded was 3.25 mg/l.

8. Alkalinity

The alkalinity makes the reservoir a nutrient rich and highly productive water body. The higher concentration of alkalinity indicates carbonates and bicarbonates richness in water.

The bicarbonate forms a major source of carbon for aquatic flora, particularly for phytoplankton in absence of free CO₂. (Kavindra *et al.*, 2019) [19]. Alkalinity is a measure of buffering capacity of the water. It is generally imparted by the salts of carbonates, bicarbonates, phosphates, nitrates, borax, silicates etc. together with the hydroxyl ions in a free state (Jain and Seethapati, 1996) [20]. In present studies alkalinity varied from 219.25 mg/l to 568.19 mg/l which show variations of carbonates and bicarbonate salts. This contributes to enhancing the nutrients in water which indicates that the lake is polluted.

Table: Physico-Chemical parameters of Gundolav Lake

S.No.	Parameters	(Bheru Ghat) Site I	(Shiv Ghat) Site II	(Nala Ghat) Site III	Average
1	Air Temperature	25.90	26.00	25.70	25.86
2	Water Temperature	23.10	20.80	23.45	22.45
3	pH	7.98	8.41	8.40	8.23

4	TDS (mg/l)	346.25	343.83	1314.25	668.11
5	DO (mg/l)	5.27	5.28	4.68	5.07
6	Depth of visibility (Cm)	64.30	61.35	44.70	56.78
7	Chloride (mg/l)	118.81	122.62	283.76	175.06
8	Nitrate (mg/l)	1.12	1.06	3.21	1.79
9	Phosphate (mg/l)	2.25	2.26	5.26	3.25
10	Alkalinity (mg/l)	219.25	226.12	568.19	337.85

Conclusion

Water is important for drinking, agricultural, domestic and industrial uses. The present study has provided baseline data for proper future monitoring of the lake. It is required to think and apply a scientific approach for the management and conservation of sustainability of the lake.

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