

ASSESSMENT OF THE PHYSICOCHEMICAL CHARACTERISTICS OF THE LAKHOTIYA TALAB AND THE GROUNDWATER IN PALI, RAJASTHAN

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ABSTRACT

Physicochemical characteristics of water are key criterion for determine the quality of water. In Pali the Lakhotiya Talab is main surface water source, while ground water is also broadly use. In the present investigation carried out to determine the physicochemical parameters such as pH, electrical conductivity, hardness, alkalinity, chloride, sulphate, nitrate, and calcium. The findings reveal that water samples of the Lakhotiya Talab showed pH moderately alkaline, while electrical conductance, hardness, showed low means the samples of groundwater fluoride, ferrous, nitrate and phosphate showed higher means value during both pre monsoon and post monsoon samples but higher mean value during post monsoon period. It found that during post monsoon season samples of both surface and groundwater was more mean value than pre monsoon season, and groundwater more polluted at many fronts than surface water. Based on these results, it recommended that surface and groundwater samples in the study are should tested before use for its portability and other domestic or industrial uses.

Keywords: Lakhotiya Talab, Surface Water, Groundwater, Physicochemical Characteristics.

Introduction

Water is an unavoidable thing in life. A Physico-chemical status of an aquatic body is directly proportional to the biological production of that water body. Physico-chemical status of any water body depends upon the climate of the encompassing area and therefore the soil texture of the water body. The life within the water body directly depends upon the Physico-chemical status of the water body.

The seasonal variation in Physico-chemical parameters like temperature, dissolved oxygen, COD, BOD, nitrate, phosphate, TDS, turbidity, etc. of water may provide countable information of water on its quality impacts on the productivity and biodiversity of the reservoir.

To assess the tropic structure of a lake it's important to review the first productivity of the lake. Aiyaz, *et al.*, (2010) studied the diversity of algal flora in Wular Lake, Kashmir, and showed that there was a correlation between conductivity, carbon dioxide, hardness, and nitrate of water with a diversity of algal flora^[1]. A Physico-chemical study by Golmarvi, D., *et al.*, (2016) at Anali International Wetland (Iran) showed the highest numbers of zooplankton were recorded in the summer months and the lowest in winter^[2]. Sumathi, M., *et al.*, (2019) in their study conclude that eutrophication in aquatic ecosystems is controlled by either nitrate or phosphate which acts as the limiting factor for plant growth^[3]. A bacterial eutrophic study by Ji, B., *et al.*, (2020) at 27 global freshwater ecosystems indicated that the supply of nitrogen and phosphorus from agricultural lands, industrial and domestic wastewaters and aquaculture is the evident cause of the increase in plankton^[4].

Choudhary, S., *et al.*, (2021) in their study on Anasagar Lake, Ajmer, Rajasthan concluded that Anthropological activities are responsible for a higher concentration of heavy metals, and the outcome of this in hypereutrophic conditions^[5]. A Physico-chemical study by Ray, J.G., *et al.*, (2021) at freshwater bodies (Kerala, India) showed total nitrogen ($p < 0.0$), dissolved oxygen ($p < 0.05$) played a crucial role in

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algal blooms [6]. Assessing the seasonal pattern of plankton by Panikkar, P., et al., (2023) at various reservoirs of Karnataka state of India showed the dominance of *Mycocystis sp.* in most of the reservoirs was due to high silicate content. It is an indication of a eutrophic condition [7].

The seasonal variation in Physico-chemical parameters like phosphate, nitrate, TDS, BOD, COD, pH, nitrate, turbidity, etc. of water may provide enumerable information on water and its quality impacts on the productivity and biodiversity of the reservoir.

The food chain of the lake ecosystem is comprising zooplankton, phytoplankton as well as secondary and tertiary consumers. Lakhotiya Talab provides water to the city dwellers. So, the study of Physico-chemical characteristics of Lakhotiya Talab has high importance, the study of their trophic status may help in optimum utilization, therefore the present investigation is an attempt to study of Physico-chemical parameter and their relationship, phytoplankton and zooplankton status in Lakhotiya Talab, Pali (Rajasthan) during the period.

Materials and Methods

Study Area

Study Area

- Location: 25.47° N 73.19° E
- Build in: 972 A.D.
- Build by: Chandanpuri Giri
- Lakhotiya pond is situated in old city Pali. The pond provides potable water to locals and animals.

Study Period

May 2023 to June 2023 (Summer season)

Methodology

Water samples were collected from marked three sampling regions during the peak of the season. Water samples were collected in clean and rinsed polyethylene sampling bottles from the surface and bottom area of the respective site; were brought to the research laboratory for Physico-chemical analysis.

The important Physico-chemical parameters of water include, Turbidity (NTU), Total Alkalinity (mg/l), Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Nitrate (mg/l), water transparency, pH value, Calcium (mg/l), Chloride (mg/l), Fluoride (mg/l), Total Hardness (mg/l), were analyzed by the methods as per IS 3025 and APHA 22ndEdt.

Result and Discussion

Physico-chemical Analysis

Table 1: Physico-chemical parameters of Surface water of Lakhotiya Talab

S.N.	Parameter	Site 1	Site 2	Site 3	Average	WHO Parameter
1	Biological Oxygen (mg/L)	29.4	22.73	28.4	26.84	<5
2	Calcium (as Ca), mg/L	58.5	55.29	5.55	43.25	60
3	Chemical Oxygen (mg/l)	8.18	7.45	9.1	8.24	250
4	Chloride (as Cl), mg/L	107.22	101.43	116.43	104.52	250
5	Colour, Hazen	0.5	0.62	0.97	0.69	5
6	Fluoride (as F), (mg/L)	0.30	0.30	0.30	0.30	1
7	Iron (as Fe, (mg/L)	0.025	0.022	0.03	0.026	0.3
8	Magnesium (as Mg) (mg/L)	20.2	18.47	21.8	19.87	<30
9	Nitrate (as NO ₃), (mg/L)	33.2	31.55	30.25	32.03	10
10	pH value	7.11	7.09	7.10	7.10	6.5-8.5
11.	Turbidity, NTU	0.8	0.82	0.96	0.86	5
12	Sulphate (as SO ₄), mg/L	119.3	123.5	129.4	124.06	500
13	Total Alkalinity, mg/L	101	96	106	103.67	200
14	Total Dissolved Solids (mg/L)	143	147	197	161	300
15	Total Hardness (mg/L)	86	107	89	94	120

According to the study, Lakhotiya Talab was characterized by a low level of total dissolved solids (TDS) of 143 mg/L, at site 1, 147 mg/L at site 2, and 197 mg/L at site 3. During the study period, the highest value of alkalinity was found at site 3. The average pH of Lakhotiya Talab was 7.10, which is slightly basic. The average value of total hardness during the study was 94 mg/L with upper surface water. This increase in total hardness during the summer period is due to the high rate of photosynthesis. In the summer season, the highest value of Biological Oxygen Demand (BOD) was found at site 1. The notable thing was the average value of Biological Oxygen and Nitrate was much higher than the WHO permissible limit.

In the present study, the value of fluoride shows similarities by an average value of at all three sites. According to WHO (1997), the permissible limit for fluoride in drinking water is 1.0 mg/L. No pesticide residue was found in the water sample as there is any agricultural area nearby.

Conclusion

The ecosystem of anyplace depends on location, fauna, and flora there. Biodiversity also plays a vital role in human welfare like food for good health, security, social relationship, life and freedom of choice, etc. The current study has relevancy to the Physico-chemical study of Lakhotiya Talab, Pali, Rajasthan.

References

1. Aiyaz, R., Mir, A., Wangones, A. R., Yoursef and Wanyanes (2010). Diversity Index of Algal Flora in Water Lake Kashmir. *Nature Envi. and Pol Tech.* 9 (2):293-298.
2. Golmarvi, D., Kapourchali, M. F., Moradi, A. M., Fatemi, M., and Nadoshan, R. M. (2016). Influence of Physico-chemical Factors, Zooplankton Species Biodiversity, and Seasonal Abundance in Anzli International Wetland, Iran. *Open Journal of Marine Science*, 7(1), 91-99.
3. Sumathi, M., & Vasudevan, N. (2019). Role of Phosphate in Eutrophication of water bodies and its Remediation. *Journal of Chennai Academy of Sciences*, 1, 65-86.
4. Ji, B., Liang, J., and Chen, R. (2020). Bacterial Eutrophic Index for Potential Water Quality Evaluation of a Freshwater Ecosystem. *Environmental Science and Pollution Research*, 27(26), 32449-32455.
5. Choudhary, S., Sharma, S., Sharma, B., and Upadhyay, B. (2021). Water Quality Analysis of Anasagar Lake, Ajmer, Rajasthan. *Asian Journal of Advances in Research*, 13-20.
6. Ray, J. G., Santhakumaran, P., and Kookal, S. (2021). Phytoplankton Communities of Eutrophic Freshwater Bodies (Kerala, India) in Relation to the Physico-chemical Water Quality Parameters. *Environment, Development and Sustainability*, 23 (1), 259-290.
7. Panikkar, P., Saha, A., Prusty, A. K., Sarkar, U. K., and Das, B. K. (2023). Assessing Hydro geo-chemistry, Water Quality Index (WQI), and Seasonal Pattern of Plankton Community in Different small and Medium Reservoirs of Karnataka, India. *Arabian Journal of Geosciences*, 15(1), 1-17.
8. Hulyal, S. B., and Kaliwal, B. B. (2009). Dynamics of Phytoplankton in Relation to Physico-chemical Factors of Almatti Reservoir of Bijapur District, Karnataka State. *Environmental monitoring and Assessment*, 153(1), 45-59.
9. Sawanth, R. S., Telare, A. B., Desai, P. D., and Desai, J. S. (2010). Variations in Hydro Biological Characteristics of Atyal Pond in GondhinglajTahasil. District-Kolhapur, Maharashtra. *Nature Env. And Poln Tech* 9 (2).
10. Vass, K. K., Wangeneo, A., Samanta, S., Adhikari, S., and Muralidhar, M. (2015). Phosphorus Dynamics, eutrophication and fisheries in the aquatic ecosystems in India. *Current Science*, 1306-1314.
11. Balali, V.K., Sharma, L.L., and Ujjania, N.C., (2016). Limnological Study of Jaismand Lake, India and its Suitability for Aquaculture and Fisheries. *International Journal of Applied and Pure Science and Agriculture Volume 02, Issue 1, January 2016*.

