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Seasonal Variation In Physicochemical Characteristics Of The Kaylana Lake: A Study

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Abstract

Physicochemical characteristics and planktonic diversity and key criterion for determining the quality of water. Kaylana Lake has the greatest importance for residents of Jodhpur. The specific physicochemical characteristics and diversity of plankton in Kaylana Lake has been studied through seasonal surveys in two annual cycles (2019-20 and 2020-21). The water remained moderately alkaline (pH) while electrical conductance (0.3458 mS/cm), chloride (168 mg/l), TDS (242 mg/l), hardness (178.36 mg/l), and alkalinity (211 mg/l) showed low mean value. Average dissolved oxygen levels were at 5.89 mg/l while average phosphate and nitrate levels were 2.88 mg/l and 3.82 mg/l respectively. The physicochemical characteristics of the Kaylana Lake indicate that water was polluted and favourable conditions for eutrophication.

Keywords: Kaylana Lake, Physicochemical characters, polluted, eutrophication.

Introduction:

Physicochemical characteristics of water body affected by soil texture, rocks of water body and surrounding biotic and abiotic components. The surrounding environment and seasonal variations also affect it. Physicochemical characteristics of any water body regulated by air temperature, water temperature, pH, Depth of Visibility, Alkalinity, TDS, Hardness, Conductivity, Phosphates, Nitrates, DO (Dissolved Oxygen), Chloride, Fluorides, Silicates, and biotic components.

Bhade, et al., (2001) in their study on Tawa reservoir of Madhya Pradesh point out that The conductivity was maximum during summer season and the reservoir showed the longitudinal decline of conductivity, which may be due to the input of nutrient ions through thermal power plant effluents. Mahajan and Mandloi (1998) in their study reported that nitrogen concentration in the soil of the water body was high during the post monsoon period while low in pre monsoon period. This may be due to washed additional nutrients and

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phosphate from the surrounding area. Jindal and Sharma (2011) in their study on Potrero de los Funes River revealed that TDS range (156-582 mg/L) was high due to sewage discharge and anthropogenic activities along the river bank. Sharma, et al., (2021) in their research in Hindon River found that during pre-monsoon season pH was between 6.8 to 7.8 while during post-monsoon season 7.2 to 8.2. There is a strong positive correlation with EC (Electrical Conductivity) with DO (Dissolved Oxygen), Turbidity and Phosphate in the post-monsoon season. Turbidity reduced in post-monsoon (Bhutiani, et al., 2017). Lakhera, et al., (2021) in their study on River Ganga Water at Rishikesh, Uttarakhand found that during Monsoon COD value was 4.58 mg/L and in winter was 13.72 mg/L. They further determined the biological oxygen demand (BOD) found 3.90 mg/L in monsoon and 1.35 mg/L in winter. Ansari, N. A. (2017) in his study seasonal variation in physicochemical characteristics in surajpur concluded that turbidity during summer season 2011-12 was lower (22.95 ± 6.15cm) while maximum (46.60±1.35 cm) in winter 2011-12. Grasim, A. B. (2014) in his study found that Physicochemical factors of an aquatic body are solely responsible for biological production and stability. These factors governed productivity and metabolism of aquatic organisms.

Any component which disturbs the natural composition of any water body is called a pollutant. Water pollutants change physicochemical characteristics of water and then target plankton diversity. Changes in physicochemical characteristics to some extent depend upon anthropogenic activities may be directly or indirectly.

2.0 Material and Methods:

During the study period, water samples were collected at seasonal intervals during 2019-20 and 2020-21, using clean 1L polyethylene bottles for analysis of water variables in the laboratory from a pre-selected station of the lake. The water quality parameters such as water and air temperature, depth of visibility, pH, alkalinity (Carbonate and bicarbonate), dissolved oxygen and primary productivity were measured in the field itself.

Digital pH meter HANNA-pHep was used for measuring hydrogen ion concentration (pH), LCD portable digital thermometer of -50^{o} C to 150^{o} C range was used to measure water temperature, Total dissolved solids were estimated by digital (Hold) TDS meter, depth of visibility was measured by a standard Secchi disc of 20 cm and results are expressed in ppm or mg/l.

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However, for the electrical conductivity, silicate, nitrogen, nitrate, orthophosphate, and fluorides samples were brought to the laboratory in a bottle of 250 ml. capacity and analysed within 24 hours. These physico-chemical parameters were analysed by APHA (2005). Prior to this, the samples were secured in the refrigerator. ELICO ion analyser LI 126 was used for measuring fluoride ions in the water, conductivity was measured by 'Systronics' direct reading conductivity meter.

2.1 Study Area:

Jodhpur is a Tourist destination and Kaylana is a Jewell. So, study on physico-chemical characteristics of lakes has high importance, the study of their trophic status may help in optimum utilization and conservation. Therefore, the present investigation is an attempt to study Physicochemical parameters in the Kaylana Lake, Jodhpur during the study period.

2.2 Sampling and Analysis:

Samples were collected from Point I (P I) collection point. Samples were collected from the surface and at a depth of 5 feet.

3.0 Results and Discussions:

Table 1. Physico-chemical Parameters of Kaylana Lake during 2019-21.

S.N.	Parameters	2019-20			2020-21			Average	Standard deviation
		Summer	Monsoon	Winter	Summer	Monsoon	Winter		
1	Air temperature (^oC)	43.6	31.4	12.8	44.2	34	11.7	29.61	14.38
2	Water temperature (^oC)	37	29.4	17.2	39.2	32	18.4	28.36	8.65
3	pH	8	6.7	7.4	8.2	7.1	7.7	7.52	0.51
4	Depth of visibility (cm.)	151.4	97	137.7	147.8	89.7	136.7	126.72	24.46
5	Alkalinity (mg/l)	259	196	157	246	198	204	210	33.87
6	TDS (mg/l)	284	231	212	264	218	227	239.33	25.91
7	Hardness (mg/l)	186	164	154	231	144	173	175.33	28.24
8	Conductivity ((mS/cm)	0.48	0.37	0.32	0.46	0.36	0.33	0.38	0.067
9	Phosphates (mg/l)	3.52	2.16	2.92	3.61	2.12	2.79	2.85	0.58

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10	Nitrates (mg/l)	4.52	2.8	3.81	4.49	2.97	3.89	3.75	0.67
11	Dissolved oxygen (mg/l)	5.3	5.7	6.4	4.7	5.8	6.2	5.68	0.56
12	Chlorides (mg/l)	224	141	166	216	169	151	177.83	31.31
13	Fluorides (mg/l)	2.6	1.09	2.12	2.47	1.23	2.17	1.94	0.64
14	Silicates (mg/l)	0.151	0.06	0.108	0.093	0.071	0.089	0.096	0.029

The results of physicochemical characteristics are summarised in Table-1. Air temperature ranges between 11.7^{o} C in winter to 44.2^{o} C in summer in 2020-21. Water temperature was observed highest during summer 2020-21 (39.2^{o} C) and lowest during winter 2019-20 (17.2^{o} C) The overall average value of air and water temperature was 29.61^{o} C and 28.36^{o} C respectively.

Water temperature showed an inverse relationship with dissolved oxygen. Such an inverse relationship has also been reported by Bowyer, et al., (2014).

In the present study, average depth of visibility was the maximum of 151.4 cm. in summer 2019-20 and minimum of 89.7 cm in monsoon 2020-2021. The results point out that during monsoon season water was turbid, pH fluctuated between 6.7 to 8.2. The minimum pH was recorded during Monsoon 2019-20. According to the study, the Kaylana Lake was characterized by low levels of dissolved oxygen with an average value of 5.68 mg/l during 2020-21. The highest dissolved oxygen value of 6.4 mg/l was observed in the winter season of 2019-20 and lowest value of 4.7 mg/l was observed in summer 2020-21.

The peak value of oxygen during winter was also observed in river Mini in their study by Pate., et al., (2013). Dissolved oxygen shows a significant negative relation with temperature by Zhzng et al., (2015). Matta, et al., (2017) in their study concluded that total alkalinity shows a positive relationship with depth of visibility, temperature, pH, TDS, total hardness, phosphate, conductivity, chloride, silicate, and respiration.

The average value of total hardness during the study was 175.33 mg/l and the lowest value of it was during monsoon season (144 mg/l) while highest value of 231 mg/l during summer 2020-21.

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The increase in total hardness is converted into carbonates and precipitated as calcium slats thus increasing hardness (Reid and Wood, 1976). The lowest hardness of the water body was in monsoon concluded by Ravikumar et al., 2013.

Electrical conductance was high during summer season whereas monsoon and winter did not show much variation. In the present study during summer of 2019-20 the highest value, 0.48 mS/cm, was recorded and lowest value of 0.32 mS/cm during winter season of 2019-20.

Venkatesharaju, et al., (2010) same result found in their study on the river Cauvery of Kollegal stretch in Karnataka. Seasonal variation in the conductivity may be due to the increased concentration of salt because of discharge effluent and organic matter.

In the present study, Total Dissolved Solid (TDS) ranged between 284 to 212 mg/l with lowest during winter of 2019-20 and highest during summer 2019-20 respectively. The observation is supported by the study of Agarwal, et al., (2010) in their study on Physico-chemical and microbiological study of Tehri dam.

Tyagi, et al., (2014) in their study on Assessment of water quality for drinking purpose in Pauri found that high evaporation increases the concentration of nitrate. The present study also found rich contents of nitrates, with maximum 4.49 mg/l during summer 2020-21 and minimum of 2.8 mg/l during monsoon 2018-19. Singh, et al., (2010) also noted in their study on Physico-chemical properties of water samples from Manipur River system that nitrate content is maximum during summer. Kumar and Yadav, (2014) studied the physicochemical characteristics of Jodhpur lakes found that nitrate showed positive relation with temperature, TDS, pH, alkalinity, total hardness, chloride, silicate, electrical conductivity, fluoride, and productivity and claimed that during monsoon season phosphate value lower than other seasons. According to Xu, et al., (2010) in their study on Tajhu, China found that there was a positive correlation between phosphorus and nitrogen concentration and phytoplankton growth in eutrophic lakes.

In present study phosphate content maximum during summer 2019-20 which was 3.61 mg/l while minimum during monsoon 2020-21 (2.12 mg/l).

The value of silicate ranged between 0.060 to 0.151 mg/l with maximum during summer 2019-20 and minimum during monsoon 2020-21.

Kaushal and Sharma (2007) observed silicate to range between 2.2 to 3.8 mg/l in selected reservoirs of Eastern Rajasthan. Silicate showed negative correlation with fluoride

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and oxygen. Human activity, Rock weathering and industrial effluent add to phosphate content in water.

In the present study, the values of fluoride varied between 1.09 to 2.6 mg/l, with maximum value during summer 2019-20 and minimum during monsoon 2019-20. According to WHO (1984) the permissible limit for fluoride in potable water is 1.0 mg/l. Fluoride showed positive correlation with hardness, depth of visibility, dissolved oxygen, pH, nitrate, phosphate, NPP and GPP. In the present study highest GPP and NPP were 402 and 254 mgc/m^2/hr, respectively in the winter season of 2020-21. The Kaylana Lake had a maximum value of Community Respiration as 231 (mgc/m^2/hr) in summer 2019-20 and minimum in monsoon (2020-21) 79 (mgc/m^2/hr).

4.0 Conclusion:

In aquatic mode of life, physicochemical characteristics of the water body changes due to natural reasons and anthropogenic activities. In the present study it was clear that during summer season pH, BOD, DO, conductivity, nitrate, and chloride were very high in comparison to monsoon season and during the whole study period the average of almost all parameters remained high indicating that the water body is polluted and favourable conditions for eutrophication.

References:

Agarwal, A. K., and Rajwar, G. S. (2010). Physico-chemical and Micro biolo-gical Study of Tehri Dam Reservoir, Garhwal Himalaya, India. *Journal of American Science*, 6(6). 65-71.

Ansari, N. A. (2017). Seasonal Variations in Physicochemical Characteristics of Water Samples of Surajpur Wetland, National Capital Region, India. *International Journal of Current Microbiology and Applied Sciences*, *6*(2), 971-987.

APHA. (2005). Standard Method of Water and Wastewater. *21st Edn., American Public Health Association, Washington, DC.*, ISBN: 0875530478. pp: 2-61.

Baghala, B. S. (2006). Studies on Biodiversity, Survival and Density of Freshwater Zooplankton in Relation to Salinity changes, *Ph. D. Thesis* Submitted to MLSU, Udaipur.

Bhade, C., Unni, K. S., and Bhade, S. (2001). Limnology and Eutrophication of Tawa Reservoir, MP State, India. *Internationale Vereinigung fur theoretische and angewandte Limnologie, Verhandlungen*, 27(6). 3632-3635.

ISSN PRINT 2319 1775 Online 2320 7876

Research paper UGC CARE Listed (Group -I) Journal Volume 11,Iss 8, Dec 2022

Bhutiani, R., Ruhela, M., and Ahamad, F. (2017). Limnological Characterization of Hindon River at NCR (Uttar Pradesh), India. *Environment Conservation Journal*, *18* (1-2_, 219-229.

Bowyer, J. N., Booth, M. A., Qin, J. G., D' Antignana, T., Thomson, M. J., and Stone, D. A. (2014). Temperature and Dissolved Oxygen Influence Growth and Digestive Enzyme Activities of Yellowtail Kingfish Seriola Lalandi (Valenciennes, 1833). *Aquacult Res*, 45(12), 2010-2020.

Grasim, A.B. (2014). Measurement Some of Physio-Chemical Parameters in Tigris River near the Centre of Baghdad City J. *Thi-Qar Sci,* 5(1).

Jindal, R., and Sharma, C. (2011). Studies on Water Quality of Sutlej River around Ludhiana with Reference to Physicochemical Parameters. *Environmental Monitoring and Assessment, 174*, 417-425.

Kaushal, D. K., and Sharma, V. K. (2007). Limnology and Productivity of Selected Reservoirs of Eastern Rajasthan. *In Proceedings of DAE_BRNS, National Symposium of Limnology*.

Kumar, A., & Yadav, N. S. (2014). Study of physiochemical characteristics of Jodhpur lakes. *International Journal of Earth Sciences and Engineering*, *7*(1), 376-380.

Lakhera, Kamini, Tripathi, D. M., and Saxena, Shruti (2021) Effect of Monsoon Season on Physicochemical Characteristics of River Ganga Water at Rishikesh, Uttarakhand. JETIR, Volume8, Issue 11, b376-b381.

Matta, G., Srivastava, S., Pandey, R. R., and Saini, K. K. (2017). Assessment of Physicochemical Characteristics of Ganga Canal Water Quality in Uttarakhand. *Environment, Development and Sustainability*, 19(2*)*, 419-431.

Mahajan, S., and Mandloi, A. K. (1998). Physicochemical Characteristics of Soil and Water in Relation to Plankton Production of Fish Culture Pond. J. *Inland Fish. Soc. India, 30*(1), 92-98.

Patel, V., and Parikh, P. (2013). Assessment of Seasonal Variation in Water Quality of River Mini, at Sindhrot, Vadodara. *International Journal of Environmental Sciences*, 3(5), 1424-1436.

Ravikumar, P., Aneesul Mehmood, M., and SOmashekar, R. K. (2013). Water Quality Index to Determine the Surface Water Quality of Sankey Tank and Mallathahalli Lake, Bangalore Urban District, Karnataka, India. *Applied Water Science*, 3(1), 247-261.

ISSN PRINT 2319 1775 Online 2320 7876

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Reid, G. K. and Wood, R. D. (1976): Ecology of Inland Waters and Estuaries. *D. Van Nostand Company*, New York.

Singh, M. R., Gupta, A., and Beeteswar, K. H. (2010). Physico-chemical Properties of Water Samples from Manipur River System, India. *Journal of Applied Sciences and Environmental Management*, 14(4).

Sharma, R., Kumar, A., Singh, N., and Sharma, K. (2021). Impact of Seasonal Variation on Water Quality of Hindon River: Physicochemical and Biological Analysis. *SN Applied Sciences*, *3*. 1-11.

Tyagi, S., Singh, P., Sharma, B., and Singh, R. (2014). Assessment of Water Quality for Drinking Purpose in District Pauri of Uttarakhand, India. *Applied Ecology and Environmental Sciences*, 2(4), 94-99.

Venkatesharaju, K., Ravikumar, P., Somashekar, R. K., and Prakash, K. L. (2010). Physico-chemical and Bacteriological Investigation on the River Cauvery of Kollegal Stretch in Karnataka. *Kathmandu University Journal of Science, Engineering and Technology*, 6(1), 50-59.

WHO (1984). Fluorine and Fluorides, Environmental Health Criteria 36. World Health Organization, Geneva. Baghela, B. S. (2006): Studies on Biodiversity, Survival and Density of Freshwater Zooplankton in Relation to Salinity changes. *Ph.D. Thesis* Submitted to M.L. Sukhadia University, Udaipur.

Xu, H., Parel, H.W., Qin, B., Zhu, G., and Gaoa, G. (2010). Nitrogen and Phosphorus Inputs Control Phytoplankton Growth in Eutrophic Lake Taihu, China. *Limnology and Oceanography*, 55(1), 420-432.

Zhzng, Y., Wu, Z., Liu, M., He, J., Shi, K., Zhou, Y., and Liu, X. (2015). Dissolved Oxygen Stratification and Response to Thermal Structure and Long-term Climate Change in a Large and Deep Subtropical Reservoir (Lake Qiandaohu, China). *Water Research*, 75, 249-258.