

Assessment of the water quality status of Alsand Lake, Dist. Sangli (M.S), India: Ecological conservation and sustainability

ABSTARCT

The present investigation deals with the seasonal variation in some important Physico-chemical parameters of Alsand Lake, District Sangli. The study was carried out from February 2022 to January 2023. Water samples were collected from selected four different sites at 15 days of intervals. Physico-chemical parameters such as pH, Electrical Conductivity, Total Dissolve Solids, Total Hardness, Total Alkalinity, Calcium, Magnesium, Phosphate, Sulphate and Nitrate, were measured and analyzed by standard methods of APHA. The data revealed that there is no significant seasonal variations in parameters throughout the year. The lake water is suitable for drinking, agricultural and fish culture point of view. This work is useful for proper monitoring and conservation of water bodies in the future.

Keywords: -*Alsand Lake, Physico-Chemical parameters, Seasonal variation.*

1. Introduction:-

Water is the most valuable resource on earth and critically important for life on earth. India has vast freshwater resources in the form of both lentic and lotic ecosystems. The lentic ecosystem include ponds, lakes, tanks and reservoirs. These reservoirs play an important role for domestic, agriculture and aquaculture as valuable water resource (Mohit Arya., et al., 2015).

Aquatic ecosystems are affected by several health stressors that significantly deplete biodiversity (Wanjari et al. 2012). Biodiversity losses because of global change, is a rising threat in these systems, with certain taxonomic groups that are key for ecosystem functioning being more vulnerable [20]. The ecosystem health concept, in a decisive difference to ecological integrity, integrates environmental conditions with anthropogenic impacts to inform about the sustainable use and management of natural resources. Understanding both concepts, ecological integrity and ecosystem health, ask for a large amount of data on abiotic and biotic variables, which are often only available on local scales, but not at larger scales, an issue also addressed with the concepts of Essential Biodiversity Variables [21].

Due to increased human population, industrialization, use of fertilizers in the agriculture, manmade activity. It is highly polluted with different harmful contaminants. That leads to a scarcity of potable water. Therefore, continuous monitoring of water bodies for water

quality is necessary (Amit G. K. et al., 2021). The physicochemical properties will also help in identification of sources of pollution for conducting further investigation of ecobiological impact and also help in the initiating necessary steps for remedial actions in case of polluted water bodies (Gaikwad et al., 2021). Understanding the geological characteristics of the lakes and the physicochemical properties of the water behind the dam are vital for the application of water resources in fish farming. Undesirable changes in the water quality of lake can pose serious risks to natural spawning ground of fishes and self-purification capacity of river. The quality variation can also generate polluted aquatic products, decrease vital elements due to sediment deposition behind dams, and decrease the growth of planktons, which plays an essential role in fish nutrition. Consequently, the economic benefits of the aquaculture industry and the quality of their products face serious risks. Therefore, assessing the reservoir water quality variables is necessary to secure downstream ecosystems and related industries such as fish farming [22].

Alsand Lake is a manmade lake situated in Khanapur Tehsil, District Sangli. Various anthropogenic activities adversely affect physicochemical parameters of the water. So present study is undertaken to analyze various physicochemical parameters of water to interpret the water quality of the reservoir. The various physicochemical parameters are used to check the quality of water such as pH, Electrical Conductivity, Total Dissolved Solids, Total Hardness, Total Alkalinity, Calcium, Magnesium, Phosphate, Sulphate, and Nitrate. This work will be helpful for conservation of the water bodies and aquatic ecosystems.

2. Material Method

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2.1 Study Area:-

The selected area for the present study is located near Alsand Village in Khanapur Tehsil, District Sangli (MH). Alsand Lake was selected for sample collection and subsequent analysis for around the year February 2022 to January 2023. It is situated 60 km away from the district headquarter Sangli. The lake is manmade, its depth is around 29 to 30 feet and the lake is surrounded by agricultural fields. The co-ordinates are between the latitude 17°12'5"N and longitude 74°29'27"E. The water from the lake used for irrigation and drinking in nearby villages.

2.2 Sample collection:-

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



Figure 1. Alsand Lake (Satellite Image)



Figure 2. Alsand lake image

3. Result

In the present investigation, pH value is highest in summer (8.29 ± 0.33) and lowest in winter (8.067 ± 0.422). The Electrical conductivity value rises in summer (0.390 ± 0.056), and lowers down in monsoon (0.295 ± 0.070). The present study recorded the highest TDS (262.2 ± 28.26) in winter and lowest in monsoon (187.7 ± 45.62). The value of Total Hardness increases (108 ± 44.78) in summer and decreases (70.75 ± 26.35) in monsoon. The findings of the study recorded the highest Total Alkalinity (329 ± 81.69) in winter and the lowest (130 ± 9.63) mg/l in summer. The value of Calcium is high in winter (62 ± 1.224) and low in summer (32.33 ± 2.867). Magnesium value rises (35.25 ± 1.479) in winter, and lowers down in summer (14.85 ± 1.888). The highest value (0.885 ± 0.085) of Phosphate was observed in winter and the lowest (0.692 ± 0.128) in monsoon. The value of sulphate increases (0.692 ± 0.128) in winter and decreases (8.0 ± 9.06) in monsoon. Nitrate value rises (4.53 ± 0.894) in winter and lowers down (3.48 ± 0.390) in summer.

Table No:-1. Seasonal record of Physico-chemical parameters of Alsand Lake during February 2022 to January 2023.

Parameter	Summer (Feb-May)	Monsoon (June-Sept)	Winter (Oct-Jan)
pH	8.29 ± 0.33	8.19 ± 0.304	8.067 ± 0.422
EC (mS/cm)	0.39 ± 0.056	0.295 ± 0.070	0.36 ± 0.040
TDS (mg/l)	241 ± 38.14	187.7 ± 45.62	262.2 ± 28.26
TH (mg/l)	108 ± 44.78	70.75 ± 26.35	96.52 ± 1.299
Total Alkalinity (mg/l)	130 ± 11.50	189.1 ± 46.85	329.4 ± 81.84
Calcium (mg/l)	32.33 ± 2.867	48.75 ± 15.89	62 ± 1.224
Magnesium (mg/l)	14.13 ± 1.643	22.25 ± 10.15	35.25 ± 1.479
Phosphate (mg/l)	0.83 ± 0.078	0.692 ± 0.128	0.885 ± 0.085
Sulphate (mg/l)	16.75 ± 11.83	8.0 ± 9.06	19.37 ± 4.421
Nitrate (mg/l)	3.48 ± 0.390	4.12 ± 1.777	4.53 ± 0.894

\pm Mean Standard Deviation

4. Discussion

Alkaline pH is observed all three seasons with no significant variation in the pH of lake water. The value of pH increases in summer because due to high heat water evaporates and makes concentrated water which increases pH of water. In the winter water is diluted than the summer that keeps the low pH of the water (Randive et al., 2015). The highest Electrical conductivity was observed in summer and the lowest in monsoon. In summer water level decreases due to heat that makes concentrated water with high ions that is responsible for high Electrical conductivity. In monsoon water is diluted due to rainfall that causes low Electrical conductivity of water (Chouhan et al., 2022). The value of Total Dissolve Solids goes up in winter because of the low water level than rainy season, fly ash from nearby jaggery factory, dead organic matter, soil and sand particles. In monsoon water is diluted by rain water which decreases Total dissolved solids slightly in the water. (Arya Mohit and Mishra, A. K. 2015). The high level of Total Hardness observed in summer and winter due to the presence of ions in water like divalent cations, chlorides and sulphates. In the rainy season it is slightly decreased due to the uptake of calcium and magnesium in developing animals during the breeding season. (Hujare M. S., 2008, Manjare et al., 2010). Total Alkalinity increases in winter due to the presence of carbonate, bicarbonate and hydroxyl ions that leach out from the ground aquifers, and water flows. In the summer there is no water flowing in the lake that carries an ions in the lake (Sarwade and Kamble., 2014). The value of calcium rises in winter and monsoon than in summer due to calcium coming through rain water flow and weathering of limes tones in lake area (Yadav Priyanka, et al., 2013). The highest value of magnesium was observed in winter and monsoon than in summer. Magnesium is always found with calcium. Magnesium is also increased by weathering and leaching of the rocks in the catchment area (Manjare. S.A., 2013). The value of Phosphate is high in winter and summer because there is a cow and buffalo pen situated near to water body which is having more than a hundred animals. These animals' visits to the lake per day causes cattle manure mix with the water and increase the Phosphate level. Washing and cleaning of vehicles, and animals (Mishra et al., 2011). Sulphate rises in summer and winter more than the monsoon because of the dead organic matter of plants and animals due to the low level of water in the lake (Borkar et al., 2022). Nitrate increases in the winter than in summer and monsoon due to the cleaning and washing of animals, crops like zinger etc. immersion of holistic things (Gay N. F., 2008).

5. Conclusion

The observations of physicochemical parameters of freshwater is very essential for determining the current status of water body and water pollution. There are total ten parameters taken for the analysis of water quality. The parameters are pH, Electrical Conductivity, Total Dissolved Solids, Total Hardness, Total Alkalinity, Calcium, Magnesium, Phosphate, Sulphate and Nitrate. All above parameters are in permissible limits except Total Alkalinity increases in the winter. The water in Alsand lake is suitable for drinking, domestic and agricultural purposes. This study will help in long term provision, which will helpful to conservation of water body and to protect ecosystem.

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