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STUDY OF PHYSICO-CHEMICAL PARAMETERS OF WATER FROM RANI TALAV, IDAR, NORTH GUJARAT

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ABSTRACT:

The present study of the Physico-chemical parameters of water from Rani Lake, Idar was conducted from 2015 to 2016. This study was conducted to determine its parameters of water included Temperature, pH, Turbidity, Total dissolved solids(TDS), Dissolved Oxygen(DO), Biological oxygen demand (BOD), Chemical oxygen demand(COD) Alkalinity, Total hardness, Calcium, Chlorides, Magnesium, Nitrate, and Sodium. To know the water quality profile of the Rani Lake, water samples periodically in each for analyzing various Physico-chemical parameters during the three seasons (monsoon, winter, and summer) in the years 2015 to 2016.

KEYWORDS: *Rani Lake; Idar; Gujarat; India; Physicochemical parameters; Freshwater.*

INTRODUCTION:

Lakes or water bodies are very important from an ecological point of view and establish reserves of biodiversity in the aquatic ecosystem. The quality of water usually states to the constituent of water present at the optimal level for suitable growth of flora and fauna. Aquatic organisms have the requirement of healthy environs to live and suitable nutrients for their growth; the productivity is contingent on the physicochemical features of the water body. The maximum productivity can be acquired only when the physical and chemical parameters are present at the optimal level. The current study aims to detect the water quality of Rani Talav by Physicochemical procedures and to determine the changes in

water quality parameters by seasons. Since these factors, Rani Talav was selected as a study area for seasonal water quality monitoring during 2015-16.

MATERIAL AND METHOD:

Study area

The Rani Lake of Idar, situated (Latitude: 23°51'42"N and Longitude: 73°1'5"E) North Gujarat, India, is one of the historical places of Idar where one Jain swetamber temple is located in the middle of the Talav. The climate of the city was very cold in winter and very hot in summer. The average rainfall of Idar was 575mm.

Water sampling and Physico-Chemical Analysis

The water samples were collected in the sampling bottles. Parameters like temperature, conductivity, total dissolved solid, total alkalinity, salinity, pH, dissolved oxygen were analyzed on the spot. For other parameters, a water sample was brought to the laboratory for further analysis. Standard methods and protocols were used to analyze water the Physico-chemical parameters (APHA and AWWA, 1992; APHA, 1998; 2000; 2012).

RESULTS AND DISCUSSION:

The physicochemical parameters such as Temperature, pH, Turbidity, Total dissolved solids (TDS), Dissolved Oxygen(DO), Biological oxygen demand (BOD), Chemical oxygen demand(COD), Alkalinity, Total hardness, Calcium, Chlorides, Magnesium, Nitrate, and Sodium of water were analyzed for the Rani Talav and results are presented in Table No. 1. These parameters were taken periodically at the different sites of the Talav.

1. Water Temperature: The temperature acting a significant role in regulating the Physico-chemical and biological parameters of water. Cumulative temperature positively affects the growth and existence of aquatic Flora and Fauna. In this study, the maximum temperature recorded was 26 °C in summer during 2015 which might be due to high solar radiation. The lowest temperature recorded 16 °C in winter during 2015, which might be due to cold low ambient temperature and shorter photoperiod.

2. pH: pH is one of the very important chemical properties of all waters, which elucidates assured important biotic and abiotic ecological characteristics of aquatic systems in general. The pH of the Rani Talav surface water ranged from 7.30 to 8.12 i.e., pH range 8.12 during the monsoon/summer season (2015) and 8.00 during the winter season (2015). The reservoir endured alkaline throughout the study.

3. Turbidity: The maximum turbidity values 4.06 NTU was recorded in the study area in 2015 due to the decomposing mat of submerged aquatic flora. The low turbidity value of 1.6 NTU was recorded during winter in 2011 due to the trapping of turbidity particles by luxuriant underwater hydrophytes in the open water area.

4. Total Dissolved Solids (TDS): The highest total dissolved solids (TDS) in summer was observed as 490 mg/L in 2015 due to the addition of dead organic substances contributed by the decomposition of aquatic organisms. The rainfall may have decreased the TDS concentration to370 mg/L (lowest TDS in the data) during the monsoon in 2015. The highest limit for TDS as suggested by W.H.O is 500 mg/ L which showed that the recorded TDS indicates the polluted water.

5. Dissolved Oxygen: The lowest demand of 5 mg/L was estimated during the summer season in 2015 but in 2015 the lowest demand of 4 mg/L was estimated during the winter season due to less vegetation and low decay of sewage at low temperature.

6. Biological oxygen demand (BOD): The highest biological oxygen demand was recorded during monsoon and winter season as 4-6 mg/L in 2015 but in 2016 maximum biochemical oxygen demand was recorded during summer and monsoon season as 5 mg/L which can be accredited to the high microbial activity in the lake water.

7. Chemical oxygen demand (COD): The high COD values show that some degree of non-biodegradable oxygen demanding pollutants were present in the water. In the present study, the highest COD value recorded 66.75 mg/L and the minimum value of COD obtained was 11.32 mg/L in 2015. Seasonal difference exposed that COD values were upper during summer seasons and lesser during winter.

8. Alkalinity: Alkalinity of water is because of the presence of carbonates, bicarbonates, and hydroxides in water. The maximum value of alkalinity was recorded during summer was 230mg/L in 2015-16. The value of alkalinity was high due to the accretion of organic matters produced by decay and decomposition of organisms and in turn, added carbonate and bicarbonate attentions in the surface water content. The lowest alkalinity was reported during winter was 190 mg/L in 2015-16.

9. Total Hardness: Total Hardness of water is mostly due to the presence of calcium and magnesium ions and is a significant sign of the toxic effect of poisonous elements

(Kumar and Ravindranath, 1998). The maximum value of total hardness was documented during summer as 270 mg/L but the maximum value of total hardness was documented during winter as 240 mg/L. Low values 200 mg/l of total hardness was recorded during the monsoon season.

10. Calcium: Maximum value of calcium content in water was recorded 48 mg/l during the summer season. Calcium concentration might have amplified due to the accumulation of sewage whereas the lowest amount of calcium was 24 mg/L recorded during the summer season.

11. Chlorides: The highest amount (88 mg/L) of chloride was recorded in summer due to frequent run-off loaded with contaminated water from the surrounding slum area and evaporation of water (Solanki, 2007). The high chloride quantity in freshwater is an important indicator suggesting organic pollution like the presence of organic matter, presumably of animal origin. The lowest value of chloride was 48 mg/L during the monsoon season in 2011. It can be connected to the dilution of Talav by rainwater.

12. Magnesium: Magnesium is important for the photosynthesis of chlorophyll-bearing plants and therefore it contacts as a limiting factor for the growth of phytoplankton. The maximum value for magnesium hardness (29.28 mg/ L) was recorded during the summer season. The lowest concentration of magnesium was 9.76 mg/L that was also documented during the summer season.

13. Nitrates: Nitrates are oxidation yields of organic nitrogen by bacteria present in soil and water where sufficient oxygen is present. The highest level of nitrates 17.8mg/L during summer. Most of the nitrate might have been resulting from the decay of organic wastes. The lowest level of nitrate in water was recorded during winter at 11 mg/L and can be due to the consumption by plankton and aquatic vegetation for metabolism.

14. Sodium: The maximum amount of sodium (59.2 mg/L) was recorded during the winter season due to the increase in the nutrient status of Talav that results in their eutrophication. The highest volume of sodium content during winter is due to the shrinkage of water volume. The lowest amount of 29.3 mg/L was documented during the summer season because of bioaccumulation by the organism.

CONCLUSION:

Rani Talav is a very important pond for local vegetation and organism. The comparative study of the Physico-chemical parameters of 2015-16 revealed that as the season changes, there is a fluctuation in the Physico-chemical parameters of the water. The information obtained from the Physico-chemical analysis of the water quality in the Rani Talav, Idar clearly shows that most of the significant quantities such as turbidity, total dissolved solids, pH, hardness, and alkalinity contents in the Talav water are above the upper threshold of the W.H.O guidelines. To withstand the ecology and aquatic life in the Talav, certain actions and planning must be taken by the government department to fight against pollution. This study may be useful for proper management and optimal utilization.

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Table No. 1: Physico-chemical parameters of collected water

Sr. No	Parameters	Monsoon	Winter	Summer	WHO (Standard for drinking)
1.	Temperature (°C)	25	16	26	30-32
2.	pH	7.3	7.3	8.12	6.5-8.5
3.	Turbidity (NTU)	4.06	1.6	4.06	5.0
4.	Total Dissolved Solid (mg/L)	370	350	490	500
5.	Dissolve Oxygen (mg/L)	4	4.5	5	5
6.	Biochemical oxygen demand (mg/L)	4	6	5	6.9
7.	Chemical oxygen demand (mg/L)	20.4	11.32	66.75	-
8.	Alkalinity (mg/L)	190	190	230	200
9.	Total hardness (mg/L)	200	240	270	200
10.	Calcium (mg/L)	24	24	48	75
11.	Chloride (mg/L)	48	48	88	200
12.	Magnesium (mg/L)	9.76	29.28	9.76	150
13.	Nitrate (mg/L)	10	11	17.8	11
14.	Sodium (mg/L)	40.7	59.2	29.3	200