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SHORT COMMUNICATION

The Study of Physico-Chemical Parameters of Prakasha Barrage Nandurbar District (M.S.) India.

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ABSTRACT
This research examines the physical and chemical characteristics of water at the Prakasha Barrage located in Nandurbar District, Maharashtra, India, over the span of one year (August 2021 - July 2022). The study's goal is to evaluate the water's suitability for human use and agricultural practices as well as its quality for preserving ecological balance. Essential parameters, including temperature, pH, dissolved oxygen (DO), total dissolved solids (TDS), free CO_2, magnesium (Mg), and calcium (Ca), were analyzed monthly from water samples. The findings show significant relationships between these factors as well as seasonal variations. The interconnectedness of water quality parameters is demonstrated, for instance, by the considerable inverse correlation between temperature and pH (r = -0.961) and the positive association between temperature and TDS (r = 0.784). This study provides essential information for sustainable water management practices in the region and emphasizes the impact of environmental factors on water quality.
Keyword: Prakasha, Barrage, Water quality.

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INTRODUCTION

Water, an essential resource, sustains life and ecosystems worldwide. Ensuring water quality is vital for human consumption and the well-being of aquatic ecosystems. Analysis of physico-chemical characteristics, including temperature, pH, dissolved oxygen, TDS, nutrients, and pollutants, is required to assess the health of a water body. In addition to determining whether water is suitable for drinking and agriculture, these metrics also reveal information on the biological balance and pollution levels in aquatic systems. Prakasha Barrage holds significance in Nandurbar District, Maharashtra. According to a recent UNESCO report, a large portion of India's population lacks access to safe drinking water, and millions still rely on unsafe water for consumption. The global occurrence of diseases and deaths is directly associated with inadequate water, sanitation, and hygiene [9]. The focus of the current research is to evaluate the physico-chemical characteristics of water at the Prakasha Barrage. In order to understand the current state of the water quality, the study will look at key elements such as pH, temperature, dissolved oxygen (DO), free CO2, total dissolved solids (TDS), and the amounts of Ca and Mg.

MATERIAL AND METHODS

Water samples had been manually gathered every month from August 2021 to July 2022 at Prakasha Barrage during the morning period from 9:00 to 11:00 am. The samples were placed in bottles. To evaluate the physicochemical properties, the Trivedi and Goel [15] and APHA [1] methodologies were used.

In order for a correlation to be considered statistically significant at a specific level, the absolute value of the correlation coefficient needs to exceed the critical value related to that significance level. The equation for determining the critical value of the Pearson correlation coefficient r is: Where:

- **r** is the correlation coefficient,
- **n** is the sample size,

t follows a t-distribution with n−2 degrees of freedom.

$t = r.\frac{\sqrt{n-2}}{\sqrt{n-r^2}}$

Given a sample size of **n**=12, we can calculate the critical correlation values required for statistical significance at the 0.05 (5%) and 0.01 (1%) levels.

For a correlation to be significant:

1. At the 0.05 level, the correlation coefficient **r** must exceed the critical value of approximately **0.576**.
2. At the 0.01 level, **r** must exceed the critical value of approximately **0.708**.

RESULT AND DISCUSSION

Temperature: The lowest recorded temperature was 22°C in January, and the highest was 33°C in May. Similar observation was observed by Jadhav and Patil (2023) in Sarangkheda barrage [3]. A strong negative correlation (-0.961) suggests that pH levels significantly decline as temperature rises. This association is highly significant, indicating that variations in temperature have a dependable and meaningful influence on pH values. In the Ganga River, a significant and negative correlation between temperature and pH was reported with r=-0.89 and p<0.01 [8].

pH: During 2011–12, the pH value was as low as 7.6 in May and as high as 8.04 in January. There is a direct correlation between pH, temperature, and water, according to Mishra et al. (2010) [6]. The dilution of alkaline chemicals is the cause of the decreased pH value. A substantial negative correlation (-0.746) indicates that as pH levels rise (making the water less acidic), TDS tends to decline. This finding is quite significant, suggesting that pH is a key factor influencing the amount of dissolved solids present. The relationship between pH and TDS reached maximum correlation at (-0.95, p<0.01) in the Ganga River[8].

Total dissolved solids: November saw the lowest level of total dissolved solids, measuring 290.65 mg/L. greater temperatures are associated with greater levels of TDS, according to a strong positive correlation of 0.784. The correlation between water temperature (Temp) and TDS was found to be significant and positive, in the Ganga River [8]. This suggests that temperature consistently influences TDS levels, likely due to elevated evaporation rates that lead to a concentration of dissolved solids [12]. Strong and positive relationships have also been found between TDS and calcium (Ca) at 0.752 and magnesium (Mg) at 0.748, suggesting that these minerals are important in the composition of TDS. These correlations are quite important, suggesting that variations in TDS are directly related to the amounts of calcium and magnesium in the water. A similar observation was made by Sen et al. 2011 [14].

Free Co_2: The Co_2 found minimum in September as 1.5 mg/l and Maximum in Month of December as 3.9 mg/l. A strong positive correlation (0.910) indicates that levels of Free CO_2 and DO increase and decrease in tandem. This connection is highly significant and may be indicative of fundamental biological processes, such as photosynthesis and respiration, which affect both factors [11]. As indicated by Jadhav et al. (2021), as DO rises, CO_2 levels decline [4].

Dissolved oxygen (D.O.) In August, the dissolved oxygen level was at its lowest, 4.55mg/L, while in January, it was at its highest, 7.86mg/L. January had the highest DO, followed by the post-monsoon [5]. Greater pH levels are frequently associated with greater DO levels, according to a moderately favorable association (0.588). A strong positive correlation of pH vs. DO in the water of Gomti River was observed by Srivastava A and Srivastava S, 2011 [13]. The moderate negative correlation(-0.654) suggests that as temperature rises, DO tends to decrease, but the relationship is not as robust as those significant at both levels. Higher temperatures make it harder for water to hold oxygen, which can affect aquatic life, though this relationship is slightly less reliable than the strongest correlations.

Magnesium: Magnesium levels were at their lowest in August (16.10mg/L) and highest in May (20.45mg/L). Magnesium is essential for reducing the harmful effects of different ions and neutralizing excess acid [7]. greater temperatures are linked to greater magnesium concentrations, according to a substantial positive association (0.714). This might be attributed to the greater solubility of minerals in warmer water. A comparable result, with a maximum correlation of (r=0.982, p<0.01), was reported in the study on temperature vs magnesium [8]. A significant negative association (-0.741), suggesting that lower magnesium contents have been related to higher pH levels. This probably indicates that magnesium may precipitate out of the water at higher pH values.

Calcium: The calcium levels were at their lowest in September (12.05mg/L) and highest in May (26.9mg/L). Since the weathering of rocks is the primary source of calcium, which is present in larger concentrations in all-natural water throughout the summer, this element is more prevalent in all-natural water [2]. A significant positive connection (0.817) suggests that elevated calcium levels are frequently linked to elevated magnesium levels. The fact that these minerals have comparable origins and behave similarly in water is probably the reason for this highly significant discovery. Rajmohan et al. (2003)

demonstrated a comparable positive correlation among the major cations found in the groundwater of the Kancheepuram Region in South India[10].

Table 1: Monthly variation of Tapi river water at Prakasha barrage Dist Nandurbar MS. (2021-22)

	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Temp	27.5	26.3	25.5	24.6	23.2	22	24.5	29	30.6	33	28.4	26.5
pH	8.2	8.4	8.4	8.5	8.6	8.9	8.5	7.9	7.8	7.6	8.1	8.6
TDS	340.1	344.1	310.5	290.65	305.8	330.5	365.56	379.3	385.5	395.6	365.25	345.6
Free Co2	1.5	1.4	1.8	2.9	3.9	3.5	3.1	2.3	2.4	2.5	2.1	2.1
Do	4.55	4.7	5.5	6.45	7.24	7.86	6.3	5.96	5.7	5.22	5.1	5.8
Mg	16.1	17.57	17.55	17.81	17.18	17.25	18.59	19.65	19.88	20.45	18.1	17.67
Ca	12.55	12.05	13.5	15.9	17.8	18.42	22.54	24.44	26.31	26.9	23.02	23.47

Table no. 2: Correlation matrix of physio-chemical parameter of Tapi river water at Prakasha barrage Dist Nandurbar MS. (2021-22)

	Temp	***pH***	***TDS***	***Free Co2***	***Do***	***Mg***	***Ca***
Temp	1						
pH	-0.96111	1					
TDS	*0.784897	-0.74555	1				
Free Co2	-0.47629	0.380555	-0.23919	1			
Do	-0.65433	**0.588234	-0.38195	*0.910405	1		
Mg	*0.71424	-0.74105	*0.74819	0.06665	-0.08025	1	
Ca	0.569074	-0.53158	*0.751847	0.256889	0.108945	*0.817556	1

***Significant at 0.01 level (>0.708), **Significant at 0.05 level (>0.576)**

CONCLUSION

Significant seasonal variations that affect water quality are revealed by a thorough analysis of the Prakasha Barrage's physical and chemical parameters. Temperature has shown a considerable effect on various parameters, including pH and TDS, underscoring that environmental changes greatly affect water chemistry. The identified relationships, such as the correlation between free CO_2 and DO (r = 0.910) and between calcium and magnesium concentrations (r = 0.817), highlight the interconnectedness of biological and chemical processes within the water body. These findings indicate that the water quality at Prakasha Barrage is generally appropriate for its intended purposes, yet it remains susceptible to changes driven by temperature and seasonal pollution. To address potential ecological and public health concerns, ongoing monitoring and mitigation strategies are advised to ensure the sustainable use of this essential water resource.

REFERENCES

1. APHA. (1985). Standard methods for the examination of water and wastewater. APHA, AWWA and WPCF. 16th ed. American Public Progress Springfield, New York.
2. Jacklin J. R, Regini B.GS.(2011). Studies on Physico-Chemical Characteristics of Freshwater Temple Ponds in Kanyakumari District South Tamil Nadu. Int. J. of Geology, Earth and Env. Sci. 1(1):59-62.
3. Jadhav H. S. & Patil. M. B. (2023) Study of Physico-Chemical Parameters of Sarangkheda Barrage of Tapi Basin from Nandurbar District. *International Journal of Research Publication and Reviews* , 4(8), pp 705-710.
4. Jadhav S., Humbe A. and Padwal N. (2021) Correlation coefficient study of physicochemical parameters of Khanapur water reservoir, dist. Osmanabad Maharashtra, india, Uttar Pradesh Journal of Zoology, 42(18), 113-117.
5. LaskarHafsa S. (2009). Phytoplankton diversity and dynamics of Chatla floodplain lake, Barak Velley, Assam, North East India, Journal of Environmental Biology. 30(6):1007-1012.
6. Mishra B.B, Chaturvedi G.B, Tiwari D.D. (2010). Phytoplankton fluctuations under the stress of abiotic factors at Kohargaddi Dam, Balrampur. Journal of Experimental Sciences. 1(5):22-24.
7. Munawar M. Limnological studies of freshwater ponds of Hyderabad, India. Hydrobiologia. 1970; 35:127-162.
8. Naseema K, A. H. Khan; M. Rehman; V. Pathak (2013) Correlation Study for the Assessment of Water Quality and Its Parameters of Ganga River, Kanpur, Uttar Pradesh, India; Journal of Applied Chemistry (IOSR-JAC), 5(3), pp 80-90.
9. Patil C. V, R. Patil, Patil N. (2017), Physico-chemical parameters of biodiversity of blue green algae in Tapi River of prakasha barrage shahada taluka Nandurbar district (M.S.) India. *International Journal of Botany Studies*, Vol 2(1), 06-11.

10. Rajmohan N., Elango N., Ramchandran S. and Natarajan M. Major ion correlation in ground water of Kancheepuram region, South India. Ind. J. Env. Prot., 2003, 45(1), p. 5-10.
11. Shanker A. K, Gunnapaneni D, Bhanu D, Vanaja M, Lakshmi N. J, Yadav S.K, Prabhakar M, Singh V. K. (2022); Elevated CO_2 and Water Stress in Combination in Plants: Brothers in Arms or Partners in Crime? Biology (Basel). 11(9):1330. Doi: 10.3390/biology11091330.
12. Shoukat, A., Hussain, M., Shoukat, Asra. (2020). Effects of Temperature on Total dissolved Solid in Water. Water Quality Study Conference, Mehran University Sindh, Pakistan 2020.
13. Srivastava A., Srivastava S., (2011), Assessment of Physico-Chemical properties and sewage pollution indicator bacteria in surface water of River Gomti in Uttar Pradesh, International Journal of Environmental Sciences, 2(1), 325-336.
14. Sen S., Paul M. K. and Borah M. (2011) Study of some Physico-Chemical Parameters of Pond and River water with reference to Correlation Study/Int. J. Chem Tech Res.,3(4).
15. Trivedi P. K, Goel P. K. (1987). Practical Methods in Ecology and Environmental Science. Environmental Publications, Karad India, 1987.