



To investigate the emphasis on ecology based on seasonal variation of some physico-chemical parameters in Salaimendha dam near Hingana tehsil district Nagpur M.S. India.

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ABSTRACT

Dam water is a vital component of India's water infrastructure, supporting agriculture, industry, and human settlements. Its significance cannot be overstated, and efforts must be made to manage dam water resources sustainably. For the study of physico-chemical parameters such as dissolved oxygen, biological oxygen demand, chloride, nitrate and phosphate from Salaimendha dam, water samples were collected for the one year monthly also, calculated mean and standard error seasonally i.e. summer, winter and monsoon during February 2022 to January 2023.

Keywords: - Dam, Ecology, Sustainably and Water quality.

INTRODUCTION

Water can be found in places like dams, lakes, reservoirs, rivers and is used by people for home needs, industry, and agriculture. The water-based ecosystem is vital because it is home to many valuable animals, particularly fish, which are a key source of protein in human diets (Gorghate *et al.*, 2021). Life's progress and the growth of human society would not have occurred without water (Gharpure *et al.*, 2017). Dam water is a lifeline for India's agriculture sector, which accounts for over 15% of the country's GDP (GOI, 2020). Dam water is used for irrigation, supporting the cultivation of crops such as rice, wheat, and sugarcane. A study on the dam's water storage capacity supports irrigation for over 1.3 million hectares of land (Kumar *et al.*, 2017). This includes implementing efficient irrigation systems, reducing industrial water usage, and promoting water conservation practices. Ensuring the sustainable management of dam water resources is critical to supporting India's growing population and economy. By implementing efficient irrigation systems, promoting water conservation practices, enhancing dam safety and maintenance, and supporting research and development, India can ensure the long-term sustainability of its dam water resources. Recognizing,

comprehending, organizing, and overseeing natural resources are crucial to stop the harm to these surface water sources like dams (Ingale *et al.*, 2015).

MATERIAL AND METHODS

During study period, sampling sites were selected at four different areas of the dam, which was easily accessible for collection of sample for physico-chemical parameters and samples were collected from sites between 8.00 am to 10.00 am in the morning hours. The sampling stations- D1, D2, D3 and D4 of Salaimendha dam. The main aim of present study is to investigate the some physico-chemical parameters.

It is recommended to conduct the analysis of water samples mainly in the field. Tasks like checking dissolved oxygen, biological oxygen demand, chloride, nitrate, and phosphate levels should be done at all stations using methods outlined by APHA (2012). This study took place over one year, from February 2022 to January 2023. Various researchers focus on hydrobiology and limnology, and our findings related to water quality based on the parameters are presented in table and figure format.

RESULTS

Dissolved oxygen:

Oxygen that is dissolved in water is crucial for the survival of all aerobic aquatic life. During the winter at Station D4, the concentration reached its peak at 10.38 ± 0.2291 mg/L, while in the summer, Station D2 showed the lowest level of 6.325 ± 0.2009 mg/L (as illustrated in tables and figures 1 to 4). The higher oxygen levels in winter may relate to cooler temperatures, whereas the lower levels in summer could stem from the heat and the breakdown of organic matter, which lowers the dissolved oxygen. This research aligns with findings from Bobdey *et al.*, (2014) conducted at Bhiwapur lake, district Nagpur, Maharashtra, India. Similar observations were also reported by Khiratkar *et al.*, (2017).

Biological oxygen demand:

Biochemical oxygen demand, commonly known as BOD, is a key measure that indicates the level of water pollution caused by organic substances that can be oxidized. The lowest recorded value was 2.3075 ± 0.1099 mg/L at Station D4 during winter, while the highest was 5.022 ± 0.464 mg/L at Station D2

in summer (as shown in tables and figures 1 to 4). The increase in value during summer could be linked to higher temperatures and the process of decomposition, whereas the lower values in winter could be associated with cooler temperatures. Similar results were noted by Ingale *et al.*, (2018).

Chloride:

Chloride ions are typically found in natural water sources. The highest concentration of chloride, measured at 35.02 ± 2.8543 mg/L, was recorded at station D2 during the summer. In contrast, the lowest level observed was 9.645 ± 1.590 mg/L at station D4 in the winter (as shown in tables and figures 1 to 4). The increased level in summer may stem from higher temperatures and the resulting evaporation of water, along with human and livestock activities. The lower winter concentration could result from dilution and the influx of fresh water, which counteracts summer stagnation. A similar pattern was reported by Nagdive (2024) at Amabala lake Rmatek, located in the Nagpur district.

Nitrate:

The most stable form of nitrogen is known as nitrate. Nitrates enter freshwater systems largely through sewage discharge, industrial waste, and runoff from farms. During the monsoon season, the highest nitrate level of 0.0788 ± 0.0027 mg/L was detected at station D2, while the lowest level of 0.0334 ± 0.0021 mg/L was recorded at station D4 in winter (as shown in tables and fig. 1 to 4). The elevated levels during monsoon may result from lake inflow, domestic waste, agricultural runoff, and wastewater containing detergents. In contrast, the lower levels in winter could be linked to higher dissolved oxygen (D.O) levels. This data aligns with findings by Sangawe *et al.*, (2023) from the Jayakwadi dam in Aurangabad, MS, India.

Phosphate:

Phosphorus stands out as the most crucial nutrient responsible for the eutrophication of water bodies, acting as the primary element in this process. During the winter months, the phosphate level was recorded at its lowest point, measuring 0.0384 ± 0.0014 mg/L at station - D4. In contrast, the highest concentration, observed during the monsoon season, reached 0.0984 ± 0.0023 mg/L at station - D2, also at station - D1 0.689 ± 0.0404 mg/L and 0.6755 ± 0.0421 mg/L at station - D3 during summer season (as shown in tables and figures 1 to 4).

Table 1: Seasonal Average Mean Values of some Physico-chemical Parameters at Station - **D1** from Salaimendha dam, during February 2022 to January 2023.

Years →	February 2022 to January 2023							
Seasons → Parameters ↓	Summer		Monsoon		Winter		Annual Average	
	MEAN	SE	MEAN	SE	MEAN	SE	MEAN	SE
D.O	6.78	0.0963	7.715	0.4592	10.065	0.1846	8.1867	0.8463
B.O.D.	4.073	0.256	3.617	0.294	2.847	0.121	3.512	0.309
Chloride	30.13	2.6967	19.935	1.4478	10.49	1.2597	20.185	4.9112
Nitrate	0.0499	0.0013	0.0666	0.0029	0.0447	0.0027	0.0537	0.0057
Phosphate	0.689	0.0404	0.424	0.0772	0.196	0.0121	0.4363	0.1234

Table 2: Seasonal Average Mean Values of some Physico-chemical Parameters at Station – **D2** from Salaimendha dam, during February 2022 to January 2023.

Years →	February 2022 to January 2023							
Seasons → Parameters ↓	Summer		Monsoon		Winter		Annual Average	
	MEAN	SE	MEAN	SE	MEAN	SE	MEAN	SE
D.O	6.325	0.2009	7.34	0.5921	9.79	0.1884	7.8183	0.8907
B.O.D.	5.022	0.464	4.8425	0.4093	3.2675	0.1747	4.3773	0.4827
Chloride	35.02	2.8543	22.593	1.7122	11.665	1.3567	23.094	5.844
Nitrate	0.0628	0.0023	0.0788	0.0027	0.0573	0.0036	0.0663	0.0056
Phosphate	0.0815	0.0031	0.0984	0.0023	0.0689	0.0024	0.0829	0.0074

Table 3: Seasonal Average Mean Values of some Physico-chemical Parameters at Station – **D3** from Salaimendha dam, during February 2022 to January 2023.

Years →	February 2022 to January 2023							
Seasons → Parameters ↓	Summer		Monsoon		Winter		Annual Average	
	MEAN	SE	MEAN	SE	MEAN	SE	MEAN	SE
D.O	6.695	0.5546	7.69	0.5546	10.02	0.1236	8.135	0.8533
B.O.D.	4.1825	0.3027	4.145	0.2115	2.9425	0.1093	3.7567	0.3527
Chloride	28.8	1.618	19.24	1.9511	10.955	1.709	19.665	4.465
Nitrate	0.0492	0.0015	0.0657	0.0032	0.0442	0.0025	0.053	0.0056
Phosphate	0.6755	0.0421	0.435	0.082	0.1905	0.0195	0.4337	0.1213

Table 4: Seasonal Average Mean Values of some Physico-chemical Parameters at Station – **D4** from Salaimendha dam, during February 2022 to January 2023

Years →	February 2022 to January 2023							
Seasons → Parameters ↓	Summer		Monsoon		Winter		Annual Average	
	MEAN	SE	MEAN	SE	MEAN	SE	MEAN	SE
D.O	7.375	0.2457	8.085	0.4932	10.38	0.2291	8.6133	0.7853
B.O.D.	3.72	0.1512	3.1325	0.1498	2.3075	0.1099	3.0533	0.3548
Chloride	23.73	2.3472	16.66	2.3472	9.645	1.5909	16.678	3.5213
Nitrate	0.04	0.0029	0.054	0.0014	0.0334	0.0021	0.0425	0.0053
Phosphate	0.0491	0.0021	0.0747	0.0019	0.0384	0.0014	0.0541	0.0093

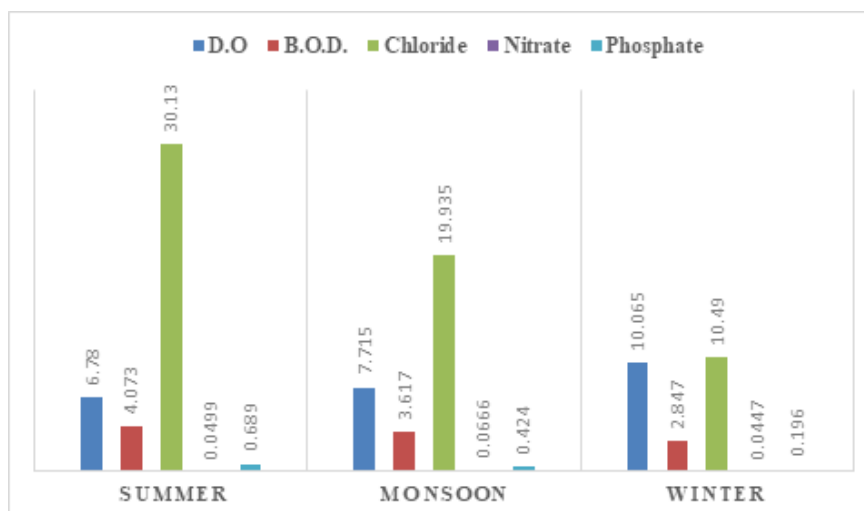


Figure 1: Seasonal average mean values of some physico-chemical parameters at Station - **D1** from Salaimendha dam, during February 2022 to January 2023.

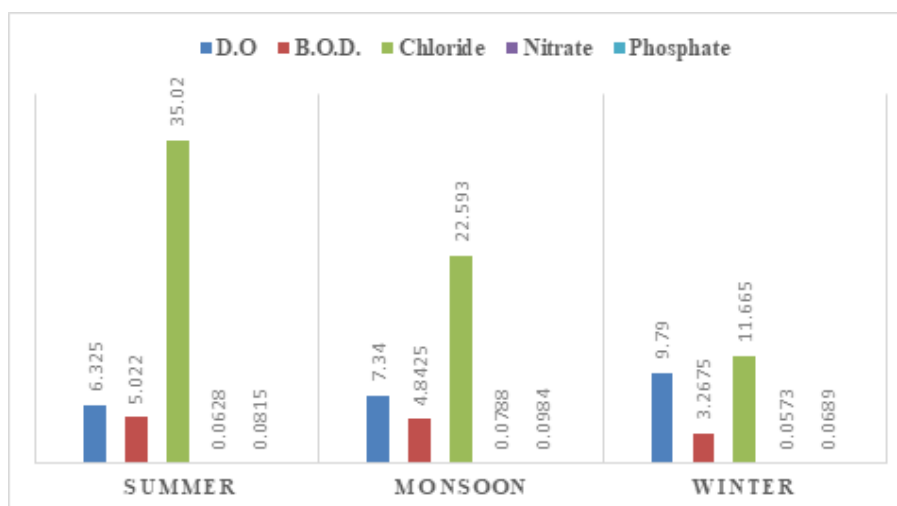


Figure 2: Seasonal average mean values of some physico-chemical parameters at Station – **D2** from Salaimendha dam, during February 2022 to January 2023.

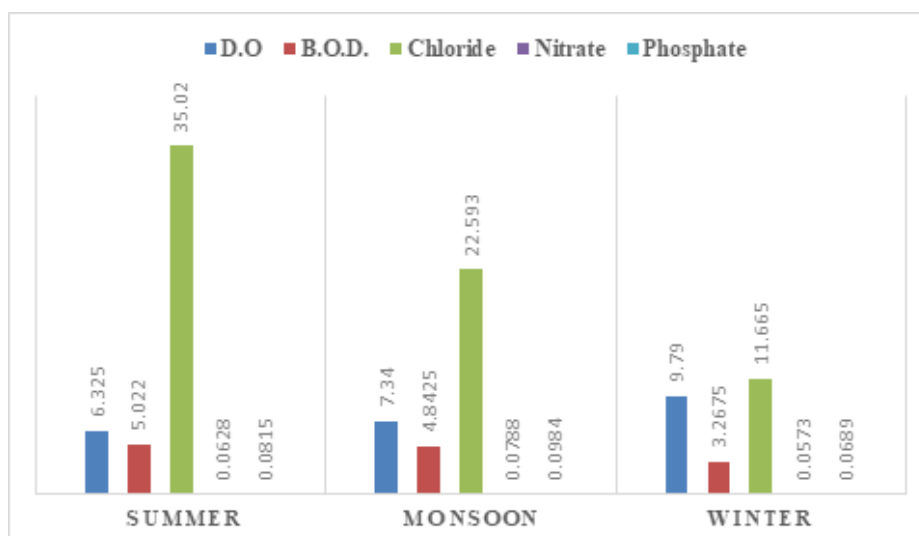


Figure 3: Seasonal average mean values of some physico-chemical parameters at Station – **D3** from Salaimendha dam, during February 2022 to January 2023.

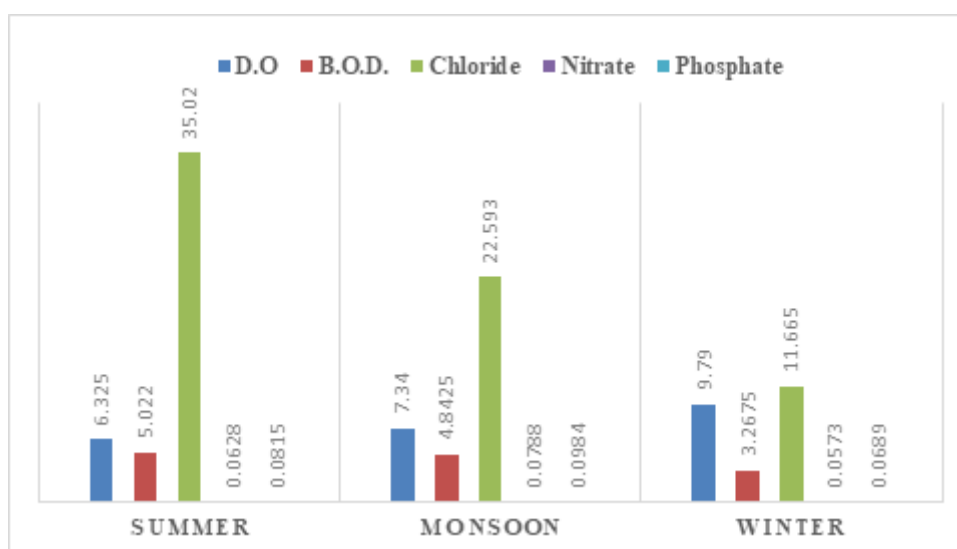


Figure 4: Seasonal average mean values of some physico-chemical parameters at Station – D4 from Salaimendha dam, during February 2022 to January 2023.

Phosphate values are very low during entire study period but still the in monsoon and summer peak could be attributed to several factors, including rainfall runoff, agricultural drainage, sewage disposal, livestock activities, and human actions like bathing. The lower levels might result from the consumption of phosphorus by rapidly growing macrophytes. This assessment aligns with findings presented by Ingale *et al.*, (2018).

CONCLUSION

An examination of various all the physico-chemical parameters indicates that the water quality in Salaimendha dam is appropriate for fish farming and agricultural irrigation. All the findings state that water of Salaimendha dam is beneficial for the fauna and flora maintain the oligotrophic status which emphasizes the ecology.

Conflict of Interest: The authors declare no conflict of interest in relation to this research.

Data Availability Statement: Not applicable.

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REFERENCES

- APHA (2012). Standard Methods for the Examination of Water and Waste Water. 22nd Edition, American Public Health Association, American Water Works Association, Water Environment Federation.
- Bobdey, A. D., Ingale, P. P., & Lonkar, A. N. (2014). Evaluation of water quality in Bhiwapur Lake, Dist. Nagpur (MS) India on the basis of some physico-chemical parameters. International Journal of Researches in Biosciences, Agriculture and Technology. Special Issue. 478-484.
- Gharpure, V. L., Bhatkulkar, M., & Ingale, P. P. (2017). Preliminary study of water quality with respect to some physico-chemical parameters in Vena river. IJRBT, Special Issue (2), Vol-V: 1161-1164.
- Government of India (GOI). (2020). Economic Survey of India.
- Gorghate Nilesh, D., Raut Mahendra, B., & Ingale Prashant, P. (2021). Diversity and conservation status of fish fauna in Chichtola lake, Gondia district, Maharashtra, India. Intern. J. Zool. Invest, 7: 16-20.
- Ingale, P. P., Bobdey, A. D., and Lonkar, A. N. (2015). Monthly variations in physico-chemical characteristics of Bhiwapur Lake dist. Nagpur (MS) India. Journal of Innovation in Science (JIS) Vol.-II, (2): 81-87.
- Ingale, P. P., Bobdey, A. D., and Gorghate, N. D. (2018). Comprehensive hydrobiological status of Bhiwapur Lake of Maharashtra, India: an environmental aspect. Journal of the Chinese Advanced Materials Society, 6(4): 655-665.
- Khiradkar S.S., Kambdi R.R., Ingale P.P., and Gorghate N.D. (2017). Preliminary study of some physico-chemical parameters in Labhansarad dam in Warora Taluka of Chandrapur District, Maharashtra State, India. International Journal of Researches in Biosciences,

Agriculture and Technology. Volume 5, Special Issue (2): 965-968.

Kumar, P., *et al.*, (2017). Water storage capacity and irrigation potential of Bhakra dam. *Journal of Agricultural Engineering*, 54(2): 1-9.

Nagdive Pravin D. (2024). Comprehensive hydrobiological status of Ambala lake Near Ramtek, Dist. Nagpur (M.S.), India. Thesis Awarded from Radha Govind University Ramgadh Jharkhand. Registration No. PhD1915251/2020.

Sangawe Vishal V., Saraf, Surekha A. and Shaikh Julfikar D. (2023). Assessment of some physico-chemical parameters of water sample from Jayakwadi dam, Aurangabad, M.S., India. *Eco. Env. & Cons.* 29 (1): 147-151.

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