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Physicochemical Properties of Water from Two Dams in Chandgad Tehsil, Kolhapur, Maharashtra

A. S. SHINDE, C. R. PATIL*, A. P. PATIL**

*Post Graduate Department of Botany, Dattajirao Kadam Arts, Commerce and Science College, Ichalkaranji – 416115, Dist.- Kolhapur, Maharashtra, India.

**Department of Botany, R. B. Madkholkar Mahavidyalaya Chandgad – 416509, Dist.- Kolhapur, Maharashtra, India.

(Affiliated to Shivaji University, Kolhapur (Maharashtra) India)

archanashindeadu@gmail.com

ABSTRACT

The water samples from Jangamhatti Dam and Tilari Dam in Chandgad Tehsil, Kolhapur (Maharashtra), were collected during the pre-monsoon (April 2025) and post-monsoon (November 2025) seasons. Physicochemical parameters such as pH, temperature, salinity, chlorides, total hardness, turbidity, electrical conductivity, calcium, magnesium, dissolved oxygen (DO), biochemical oxygen demand (BOD), and chemical oxygen demand (COD) were analyzed and compared with the standard values recommended by the World Health Organization (WHO). The results indicated noticeable variations in these parameters between the two dams.

Keywords: Jangamhatti Dam, Tilari Dam, Physicochemical analysis

Introduction:

Water quality analysis involves the examination of the physicochemical characteristics of water resources and is essential for determining their suitability for various uses (Chapman, 1996). Numerous parameters have been recommended for assessing water quality based on physical and chemical properties (Hem, 1985). The evaluation of water quality generally includes the analysis of parameters such as temperature, pH, electrical conductivity, hardness, and other related factors (Wetzel, 2001).

The present study was undertaken to analyze the physicochemical properties of dam water in the Chandgad region of Kolhapur District, Maharashtra, with specific emphasis on Jangamhatti Dam and Tilari Dam. These reservoirs play a vital role in regional water supply and ecological balance. The study further examines seasonal variations in water quality by analyzing samples collected during the pre-monsoon (April 2025) and post-monsoon (November 2025) periods.

The parameters analyzed included pH, temperature, salinity, chlorides, total hardness, turbidity, electrical conductivity, calcium, magnesium, dissolved oxygen (DO), BOD, and COD. All analyses were carried out following standard methods recommended by the American Public Health Association (APHA, 1985) and the results were compared with guideline values suggested by the World Health Organization (WHO, 2017).

Material and Methods:

The present study was carried out at Jangamhatti Dam and Tilari Dam located in Chandgad Tehsil of Kolhapur. The investigation involved the following three major steps:

1. Regular collection of surface water samples from designated locations.
2. Analysis of the collected samples using standard methods.
3. Data evaluation and interpretation.

Water samples were collected during the pre-monsoon and post-monsoon seasons of 2025. Three samples were collected from each location during each sampling period. Sampling was conducted from April to November 2025 at approximately 8:00 AM to minimize diurnal variations in physicochemical parameters (Wetzel, 2001).

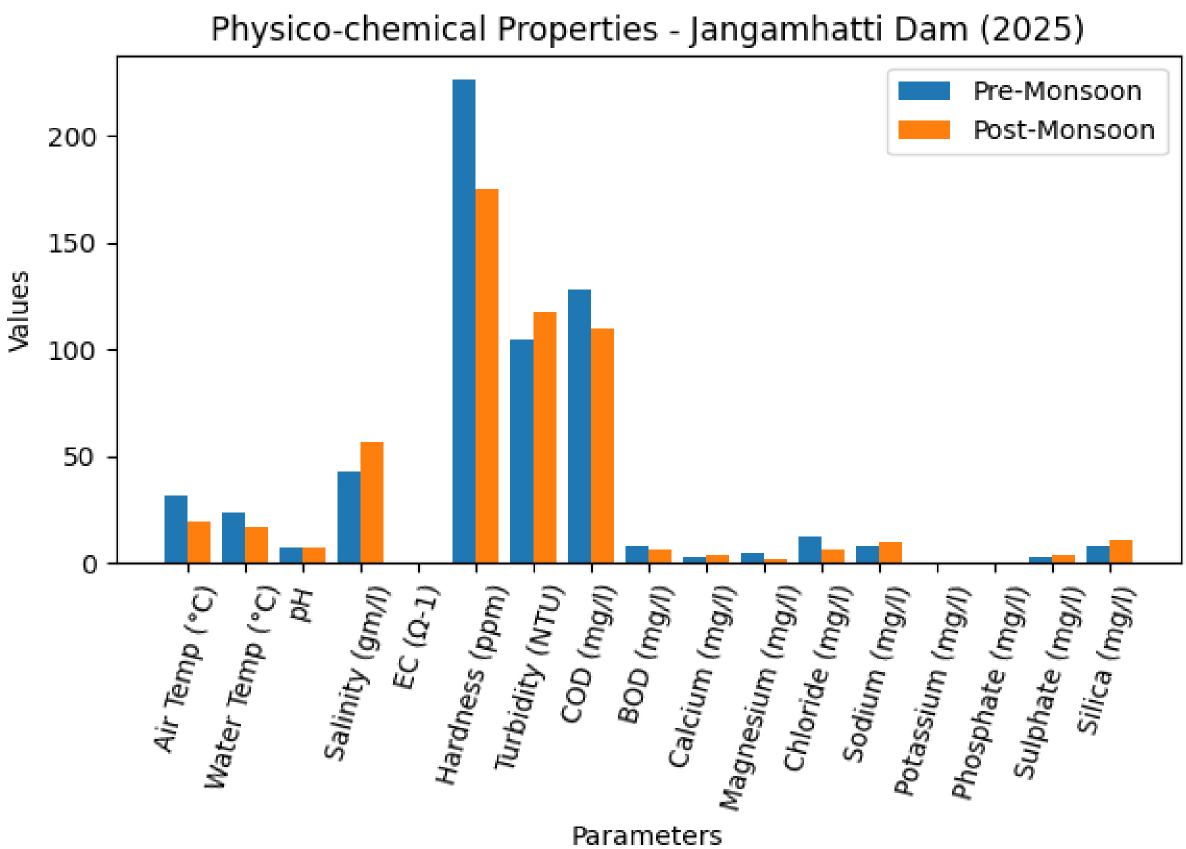
The physicochemical parameters analyzed included pH, temperature, salinity, chlorides, total hardness, turbidity, electrical conductivity, calcium, magnesium, dissolved oxygen (DO), biochemical oxygen demand (BOD), and chemical oxygen demand (COD). Standard procedures were followed for sample collection, preservation, and analysis as recommended by APHA (1985; 2017). Methods described by Trivedy and Goel (1986) were also referred to for certain chemical estimations.

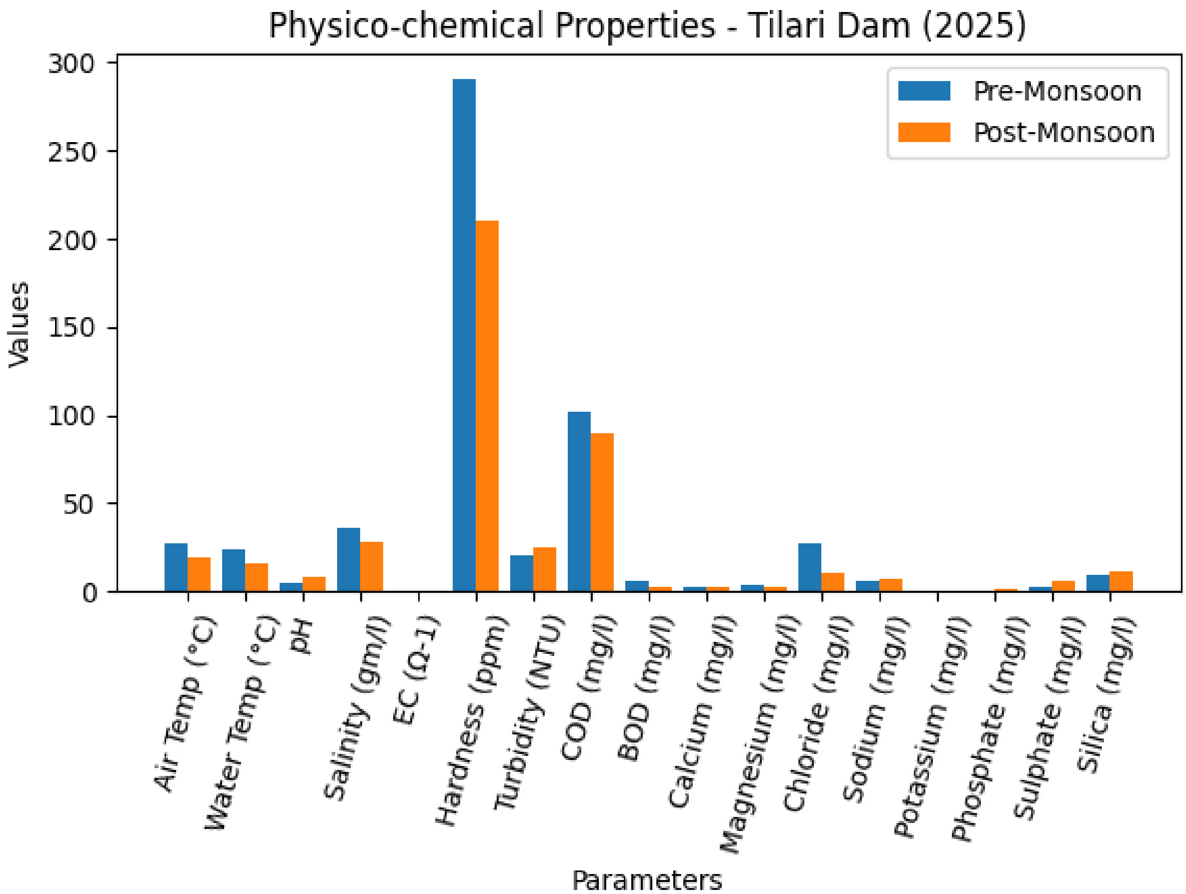
Dissolved oxygen was analyzed using the Winkler method, while BOD and COD were determined following standard titrimetric procedures (APHA, 1985). Electrical conductivity and pH were measured using calibrated digital meters. Total hardness, calcium, and magnesium were estimated using the EDTA titration method as per standard guidelines (APHA, 1985; BIS, 2012). Chlorides were determined by the argentometric titration method. All results were compared with the permissible limits prescribed for drinking water quality by the World Health Organization (WHO, 2017) and the Bureau of Indian Standards (BIS, 2012) to assess the suitability of the water for domestic and ecological purposes.

Results and Discussion:

Table 1: Physicochemical properties of water samples – Jangamhatti and Tilari Dams (2025)

Properties	Jangamhatti Dam		Tilari Dam	
	Pre-Monsoon	Post-Monsoon	Pre-Monsoon	Post-Monsoon
Air Temperature (°C)	31.8	19.3	27.1	19.7
Water Temperature (°C)	24	17	23.3	16.2
pH	6.9	7.0	5.1	7.6
salinity (gm/l)	42.7	56.8	36.2	28.4
Electrical Conductivity Ω^{-1}	0.11	0.140	0.136	0.217
Hardness (ppm)	226	175	290	210
Turbidity (NTU)	104.2	117.8	20.6	25.3
COD (mg/l)	128	110	102	89
BOD (mg/l)	7.8	6.1	6.3	2.8
Calcium (mg/l)	3	4	2	3
Magnesium (mg/l)	5	2	4	2
Chloride (mg/l)	12	6	27	10
Sodium (mg/l)	8	10	6	7
Potassium (mg/l)	0.1	0.1	0.2	0.4
Phosphate (mg/l)	0.10	0.12	0.8	0.9
Sulphate (mg/l)	3	4	2	6
Silica (mg/l)	8.3	10.5	9.2	11.5





The physico-chemical characteristics of water samples collected from Jangamhatti Dam and Tilari Dam during the pre-monsoon and post-monsoon seasons (2025) showed marked seasonal variations due to rainfall, runoff, and catchment influences. These findings are consistent with earlier limnological studies (Wetzel, 2001; APHA, 2017). Air and water temperatures were higher during the pre-monsoon season in both dams and decreased during the post-monsoon period.

In Jangamhatti Dam, air temperature decreased from 31.8°C to 19.3°C, and water temperature from 24°C to 17°C. In Tilari Dam, air temperature declined from 27.1°C to 19.7°C, and water temperature from 23.3°C to 16.2°C. Lower post-monsoon temperatures enhance the solubility of dissolved oxygen and improve aquatic environmental conditions (Wetzel, 2001).

In Jangamhatti Dam, pH showed a slight increase from 6.9 to 7.0, remaining near neutral and indicating stable water quality. In Tilari Dam, pH increased significantly from 5.1 (acidic) to 7.6 (slightly alkaline), suggesting buffering action and dilution of acidic components during the monsoon. Overall, post-monsoon pH levels in both dams fall within acceptable limits for aquatic life as recommended by WHO (2017) and BIS (2012).

Salinity increased in Jangamhatti (42.7 to 56.8 g/L) but decreased in Tilari (36.2 to 28.4 g/L) during the post-monsoon season. Electrical conductivity increased in both reservoirs. In Jangamhatti, electrical conductivity increased from 0.11 to 0.140 Ω^{-1}, while in Tilari it increased from 0.136 to 0.217 Ω^{-1} during the post-monsoon period. The increase in conductivity indicates a higher dissolved ionic content, likely due to runoff carrying minerals and dissolved salts (Tiwari & Chauhan, 2006).

Total hardness showed a noticeable decrease after the monsoon season in both dams. In Jangamhatti Dam, total hardness decreased from 226 ppm during the pre-monsoon period to 175 ppm in the post-monsoon period. Similarly, in Tilari Dam, total hardness decreased from 290 ppm before the monsoon to 210 ppm after the monsoon. This reduction may be attributed to dilution by rainwater (APHA, 2017). Tilari exhibited higher hardness values compared to Jangamhatti, indicating a greater mineral content.

Turbidity increased in both dams during the post-monsoon season. This increase is likely due to soil erosion and the inflow of suspended particles from the catchment area during heavy rainfall (Chapman, 1996). Jangamhatti recorded considerably higher turbidity, indicating a greater sediment load. Both COD and BOD values decreased during the post-monsoon period, suggesting dilution of organic pollutants due to monsoon inflow (Trivedy & Goel, 1986). However, relatively high COD values indicate the presence of oxidizable organic matter, particularly in Jangamhatti.

Calcium levels increased slightly in both dams during the post-monsoon season, whereas magnesium levels decreased. Chloride concentrations decreased significantly, reflecting a dilution effect. Sodium and potassium showed only minor seasonal variations. These changes indicate the influence of rainfall and runoff on the ionic composition of the water (Wetzel, 2001).

Phosphate levels increased slightly in both dams (Jangamhatti: 0.10 to 0.12 mg/L; Tilari: 0.8 to 0.9 mg/L), possibly due to agricultural runoff (Carpenter et al., 1998). Sulphate levels also increased during the post-monsoon season, likely due to soil leaching and mineral dissolution. Elevated nutrient concentrations may promote algal growth if not properly monitored (Smith et al., 1999). Silica concentrations increased in both dams during the post-monsoon period, which may be attributed to enhanced weathering and runoff from the surrounding geological formations (Wetzel, 2001).

Conclusion:

The results clearly indicate that monsoon rainfall plays a significant role in influencing water quality in both Jangamhatti Dam and Tilari Dam. During the post-monsoon season, decreases were observed in temperature, total hardness, COD, and BOD, whereas turbidity, electrical conductivity, nutrient concentrations, and silica levels showed an increase. The pH values improved and stabilized after the monsoon period.

Comparatively, Tilari Dam exhibited relatively better water quality, particularly in terms of lower turbidity and BOD values. In contrast, Jangamhatti Dam recorded higher turbidity and salinity during the post-monsoon season.

These findings highlight the importance of regular monitoring and effective watershed management practices to control sediment load and nutrient enrichment, thereby ensuring sustainable water quality for domestic, irrigation, and ecological purposes.

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