



ASSESSMENT OF WATER QUALITY OF UTHALA DAM, SHIRUR KASAR, DISTRICT BEED, MAHARASHTRA, INDIA

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Abstract : Water quality assessment is essential to determine the suitability of surface water for drinking, irrigation, and ecological sustainability. The present study evaluates the physico-chemical quality of water collected in 2025 from Uthala Dam, Shirur Kasar, District Beed (M.S.), India. The parameters analyzed include pH, turbidity, temperature, total dissolved solids (TDS), total hardness, total alkalinity, calcium, magnesium, chemical oxygen demand (COD), biochemical oxygen demand (BOD), and dissolved oxygen (DO). Standard analytical methods prescribed by the Bureau of Indian Standards (IS 3025 series) and APHA were followed. The results showed that the water is slightly alkaline (pH 8.61), has low turbidity (1.2 NTU), moderate TDS (284.55 mg/L), and is moderately hard (250 mg/L as CaCO₃). Alkalinity, calcium, and magnesium were within permissible limits. However, higher BOD (18 mg/L) and COD (33.31 mg/L) values indicate significant organic pollution, while DO (5.20 mg/L) was just at the minimum desirable level for aquatic life. The study suggests that although most physico-chemical parameters are within acceptable limits, the organic load is relatively high, and proper treatment is required before the water is used for drinking purposes. Regular monitoring is recommended to ensure sustainable utilization and protection of the water body.

Keywords: Water quality, Uthala Dam, Physico-chemical parameters, BOD, COD, DO, IS 3025, BIS standards

1. Introduction

Water is a vital natural resource that supports life, agriculture, industry, and ecosystem stability. Surface water bodies such as dams and reservoirs are important sources of freshwater, especially in semi-arid regions like Maharashtra. The quality of water in such reservoirs is influenced by natural processes such as weathering of rocks and soils, as well as by anthropogenic activities including agricultural runoff, domestic waste discharge, and organic matter accumulation (Wetzel, 2001; Sawyer *et al.*, 2003). Physico-chemical analysis is widely used to assess water quality because it provides reliable information on the chemical nature and pollution status of water bodies (Trivedi & Goel, 1986). Parameters such as pH, turbidity, TDS, hardness, alkalinity, calcium, and magnesium reflect the basic chemical characteristics of water, while oxygen-related parameters such as DO, BOD, and COD are indicators of organic pollution and ecological health (Chapman, 1996; APHA, 2017).

The pH of water influences most biological and chemical reactions in aquatic systems and determines the solubility and toxicity of many substances (WHO, 2017). Turbidity indicates the presence of suspended particles that affect light penetration and aesthetic quality. TDS represents the total mineral content of water and influences taste and palatability (Sawyer *et al.*, 2003). Hardness, mainly caused by calcium and magnesium salts, affects domestic and industrial uses of water (Trivedi & Goel, 1986). Alkalinity reflects the buffering capacity of water against sudden changes in pH (APHA, 2017). Dissolved oxygen is a key parameter for assessing the ecological health of water bodies, as most aquatic organisms require sufficient oxygen for survival (Chapman, 1996). BOD measures the amount of biodegradable organic matter, while COD indicates the total quantity of oxidizable organic and inorganic substances present in water (Sawyer *et al.*, 2003). Elevated BOD and COD values generally suggest organic pollution and potential stress on aquatic ecosystems.

The present investigation aims to assess the water quality of Uthala Dam, Shirur Kasar, District Beed (M.S.), using physico-chemical parameters and to evaluate its suitability for domestic and ecological use based on standard guidelines.

2. Materials and Methods

2.1 Study Area

Uthala Dam is located at Shirur Kasar in Beed District, Maharashtra (India). The dam is an important source of water for domestic and agricultural purposes in the surrounding region. The climate is typically tropical with distinct seasonal variations, and the water quality is influenced by rainfall, catchment runoff, and human activities.

2.2 Sample Collection

Water samples were collected during 2025 in clean and sterilized polyethylene bottles. Precautions were taken to avoid contamination. Samples were transported to the laboratory and analyzed as early as possible. DO samples were fixed immediately at the sampling site as per standard procedures.

2.3 Analytical Methods

The following standard methods were adopted for the current investigations;

The analysis of water samples was carried out using standard procedures recommended by the Bureau of Indian Standards (BIS) and the American Public Health Association (APHA). The pH of water was determined by the electrometric method using a digital pH meter as described in IS 3025 (Part 11). Turbidity was measured by the nephelometric method following IS 3025 (Part 10), while temperature was recorded using a calibrated thermometer as per IS 3025 (Part 9). Total dissolved solids (TDS) were estimated by the gravimetric method according to IS 3025 (Part 16). Total hardness was determined by the EDTA titrimetric method as prescribed in IS 3025 (Part 21), and total alkalinity was measured by acid titration using standard sulfuric acid following IS 3025 (Part 23). Calcium content was estimated by EDTA titration method as per IS 3025 (Part 40), and magnesium was calculated from the difference between total hardness and calcium hardness following IS 3025 (Part 46). Dissolved oxygen (DO) was determined by the modified Winkler's iodometric method as described in IS 3025 (Part 38). Biochemical oxygen demand (BOD) was estimated by the 5-day incubation method at 20 °C following IS 3025 (Part 44), which measures the oxygen consumed by microorganisms during the biological oxidation of organic matter. Chemical oxygen demand (COD) was determined by the closed reflux dichromate method as recommended in APHA Standard Methods 5220B. All analyses were performed carefully under laboratory conditions, and the results were expressed in standard units to ensure accuracy, reliability, and comparability with national and international water quality standards

3. Observations and Results

The physico-chemical analysis of water carried out in 2025 revealed (Table No. 3.1) that the water was slightly alkaline in nature with a pH value of 8.61. Turbidity was low (1.2 NTU), indicating that the water was relatively clear and contained a small amount of suspended particles.

Table 3.1 Physico-chemical characteristics of water (2025)

| Sr. No. | Parameter | Result | Unit | Method of Analysis |
|---------|--|--------|------|--------------------|
| 1 | pH | 8.61 | – | IS 3025 (Part 11) |
| 2 | Turbidity | 1.2 | NTU | IS 3025 (Part 10) |
| 3 | Temperature | 26 | °C | IS 3025 (Part 9) |
| 4 | TDS | 284.55 | mg/L | IS 3025 (Part 16) |
| 5 | Total Hardness (as CaCO ₃) | 250 | mg/L | IS 3025 (Part 21) |
| 6 | Total Alkalinity (as CaCO ₃) | 143 | mg/L | IS 3025 (Part 23) |
| 7 | Calcium (as Ca) | 75 | mg/L | IS 3025 (Part 40) |
| 8 | Magnesium (as Mg) | 15.25 | mg/L | IS 3025 (Part 46) |
| 9 | COD | 33.31 | mg/L | APHA 5220B |
| 10 | BOD | 18 | mg/L | IS 3025 (Part 44) |
| 11 | DO | 5.2 | mg/L | IS 3025 (Part 38) |

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The recorded temperature of 26 °C was normal for surface water in tropical regions and was suitable for aquatic life. The total dissolved solids (284.55 mg/L) were well within the acceptable limit, showing that the water had low mineral and salt content. Total hardness was found to be 250 mg/L as CaCO₃, which categorizes the water as moderately hard. Total alkalinity (143 mg/L as CaCO₃) indicated good buffering capacity and stability of pH.

Calcium (75 mg/L) and magnesium (15.25 mg/L) concentrations were within permissible limits and contributed to the hardness of water without posing any serious health hazards.

The dissolved oxygen level was 5.20 mg/L, which is just sufficient to support aquatic organisms. However, the biochemical oxygen demand (18 mg/L) and chemical oxygen demand (33.31 mg/L) values were comparatively high, indicating the presence of considerable organic and oxidizable matter in the water. This suggests a certain degree of organic pollution and highlights the need for treatment before the water is used for drinking purposes.

4. Discussion

The pH value of 8.61 indicates that the water is slightly alkaline. According to BIS (2012), the desirable pH range for drinking water is 6.5–8.5; hence, the observed value is marginally above the upper limit. Slight alkalinity in reservoir water is common and is often associated with the presence of bicarbonate and carbonate ions (Wetzel, 2001).

The turbidity value of 1.2 NTU indicates low suspended matter and relatively clear water. BIS (2012) recommends 1 NTU as the desirable limit and 5 NTU as the permissible limit, suggesting that the water is well within acceptable conditions.

TDS concentration of 284.55 mg/L is far below the acceptable limit of 500 mg/L (BIS, 2012), indicating low mineralization and good palatability of water (Sawyer et al., 2003).

Total hardness was recorded as 250 mg/L, which classifies the water as moderately hard. Trivedi and Goel (1986) reported that water with hardness between 150–300 mg/L is moderately hard and generally suitable for domestic use. However, moderate hardness may cause scaling in pipes and household appliances.

Total alkalinity of 143 mg/L is within the acceptable limit of 200 mg/L, showing adequate buffering capacity and stability of pH (APHA, 2017). Calcium concentration (75 mg/L) was at the upper permissible limit, while magnesium (15.25 mg/L) was well within acceptable levels, both contributing to hardness but not posing any serious health hazards (BIS, 2012).

The dissolved oxygen concentration was 5.20 mg/L, which is just above the minimum desirable level of 5 mg/L required for sustaining aquatic life (Chapman, 1996). Lower DO values may cause stress to aquatic organisms, especially under high organic load conditions. The BOD value of 18 mg/L is significantly higher than the recommended limit of 3 mg/L for clean surface water (Trivedi & Goel, 1986; APHA, 2017). This indicates the presence of high biodegradable organic matter and microbial activity. Similarly, the COD value of 33.31 mg/L suggests the presence of both biodegradable and non-biodegradable oxidizable substances in the water (Sawyer et al., 2003).

The combined high BOD and COD values point toward organic pollution, possibly due to runoff carrying organic waste, domestic sewage, or decaying vegetation into the dam. This emphasizes the need for effective management and treatment before water is used for drinking.

5. Conclusion

The present study shows that the water of Uthala Dam is slightly alkaline, moderately hard, and low in dissolved solids. Most of the physico-chemical parameters such as turbidity, TDS, alkalinity, calcium, and magnesium are within permissible limits as per BIS standards. However, the elevated BOD and COD values indicate significant organic pollution, and the DO level is just at the minimum acceptable threshold for aquatic life.

Therefore, although the water may be suitable for irrigation and certain domestic uses after basic treatment, it is not directly suitable for drinking without proper purification. Continuous monitoring, prevention of organic waste entry, and awareness among local communities are necessary to maintain and improve the quality of this important freshwater resource.

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