HIMALAYAN JOURNAL
OF BASIC & APPLIED SCIENCES
An open-access, peer-reviewed platform for basic and applied sciences
himalayanjournal.org
RESEARCH ARTICLE
Volume: 2 | Issue: 3
Date, Month, Year: 1, June 2026
Pages: 1-7
Doi : doi.org/10.5281/zenodo.20675029
ISSN (Online): 3107-9113
editor@orchidsocietyofassam.com

Study of the Correlation Between Water Quality and Distribution of Surface Water Aquatic Macrophytes in Talibor Lake, Dhing, Nagaon, Assam, India

Priyanka Bora[1]*, Ujjayanta Das[2]

[1]Department of Botany, Darrang College, Tezpur, Assam, India
[2]Department of Zoology, Dhing College, Nagaon, Assam, India

*Corresponding Address: borapriyanka412@gmail.com

Abstract

Talibor Lake in Dhing Town, Nagaon, is experiencing progressive deterioration due to effluents, sewage, and municipal waste. Physico-chemical and biological parameters were analyzed across selected sampling stations to assess pollution sources and impacts. Surveys of nearby residents highlighted adverse effects on agriculture, horticulture, and drinking water. Key indicators such as biochemical oxygen demand (BOD), dissolved oxygen (DO), pH, total dissolved solids (TDS), turbidity, alkalinity, hardness, and chloride revealed significant changes in water quality. The study demonstrates how pollution-driven water quality shifts directly influence the distribution and growth of aquatic macrophytes.

Keywords: *Agriculture, Biochemical oxygen demand, Dissolved oxygen, Ecosystem, Horticulture, Pollution*

Introduction

Water is among the most vital natural resources on Earth, indispensable for sustaining life and enabling socio-economic development [1]. The two principal sources of water - surface water and groundwater - have undergone considerable degradation due to rapid population growth, industrial expansion, and urbanization [2]. The quality of surface water in any region is primarily governed by two major factors: natural processes, including precipitation, soil erosion, and vegetation dynamics, and anthropogenic activities such as domestic and industrial effluents and agricultural runoff. While municipal and industrial wastewater serve as continuous sources of pollution, surface runoff is largely shaped by climatic conditions. Water quality plays a crucial role in determining its suitability for various uses, making assessment essential for evaluating the usability of water resources [3]. The physical, chemical, biological, and aesthetic characteristics of water are key parameters used to describe its quality and assess its appropriateness for diverse purposes, including safeguarding human health and maintaining aquatic ecosystems. These properties are influenced by substances that are either dissolved or suspended in water, and they are affected by both natural processes and human interventions [4]. Seasonal variations in precipitation, surface runoff, groundwater flow, interception, and water abstraction significantly impact both the quantity and quality of water [5, 6]. Access to clean and safe water has been strongly associated with improved global health outcomes [5, 6]. Nevertheless, despite progress in expanding access to potable water, millions of people worldwide continue to suffer from preventable diseases caused by the consumption of contaminated water.

Water pollution arises from several significant and commonly observed factors, such as:

1. The deliberate or accidental discharge of hazardous substances and chemicals into water bodies is a major contributor to pollution.
2. Rainfall can transport contaminants from polluted land surfaces, carrying toxic and harmful materials into nearby water sources and degrading their quality.
3. Various point and non-point sources, such as oil refineries, chemical waste disposal facilities, construction sites, and dumping grounds, generate or store large quantities of hazardous waste, which can ultimately contaminate water systems.

Received:30th *May*, 2026; *Revised & Accepted: 8th June, 2026;* Published *Online*: 12th *June, 2026*
Published by Orchid Society of Assam

The study objectives are:

1. To evaluate key physical and chemical water quality parameters.
2. To identify aquatic macrophytes present in the lake.
3. To analyze the relationship between water pollution and macrophyte distribution.

Materials and Methods

Study Area

Dhing is a town in the Nagaon District of Assam, India, situated at approximately 26.470° N and 92.470° E. Located on the southern bank of the Brahmaputra River, it lies about 25-26 km northwest of Nagaon city. Talibor Lake is one of the water bodies located at Dhing Town within the Nagaon District of Assam and originated during an earthquake. It covers a total area of nearly about 1 km and flows through the heart of Dhing Town. Five sampling sites were selected randomly, as shown in Figure 3, and the details of the sampling sites are presented in Table 1. During this study, surface water aquatic macrophytes were collected by hand with the help of a knife and packed in plastic bags for identification.

Table 1. Water Sample Collecting Sites with Their Geographical Location

Sites	Water sample collecting sites	Geographical location
Site 1	Chatt Puja side of Talibor Lake	Lat. 26.460015°, Long. 92.483498°
Site 2	Agriculture side of Talibor Lake	Lat. 26.461415°, Long. 92.483678°
Site 3	Jagannath Mandir side of Talibor Lake	Lat. 26.460646°, Long. 92.483239°
Site 4	Dhing Market area of Talibor Lake	Lat. 26.459796°, Long. 92.484510°
Site 5	Pujabari Bisharjan Ghat of Talibor Lake	Lat. 26.455593°, Long. 92.484124°

The base map shows major and minor roads, railway lines, water bodies, BPHC, and other features. The map prepared for the study area is shown in Figure 1. Figure 2 shows Dhing Town on the Nagaon district map.

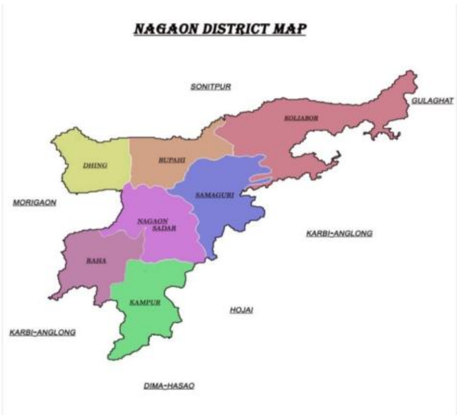

Fig 1: *Dhing in Nagaon District, Assam*

Fig 2: *Base Map of Dhing, Nagaon*

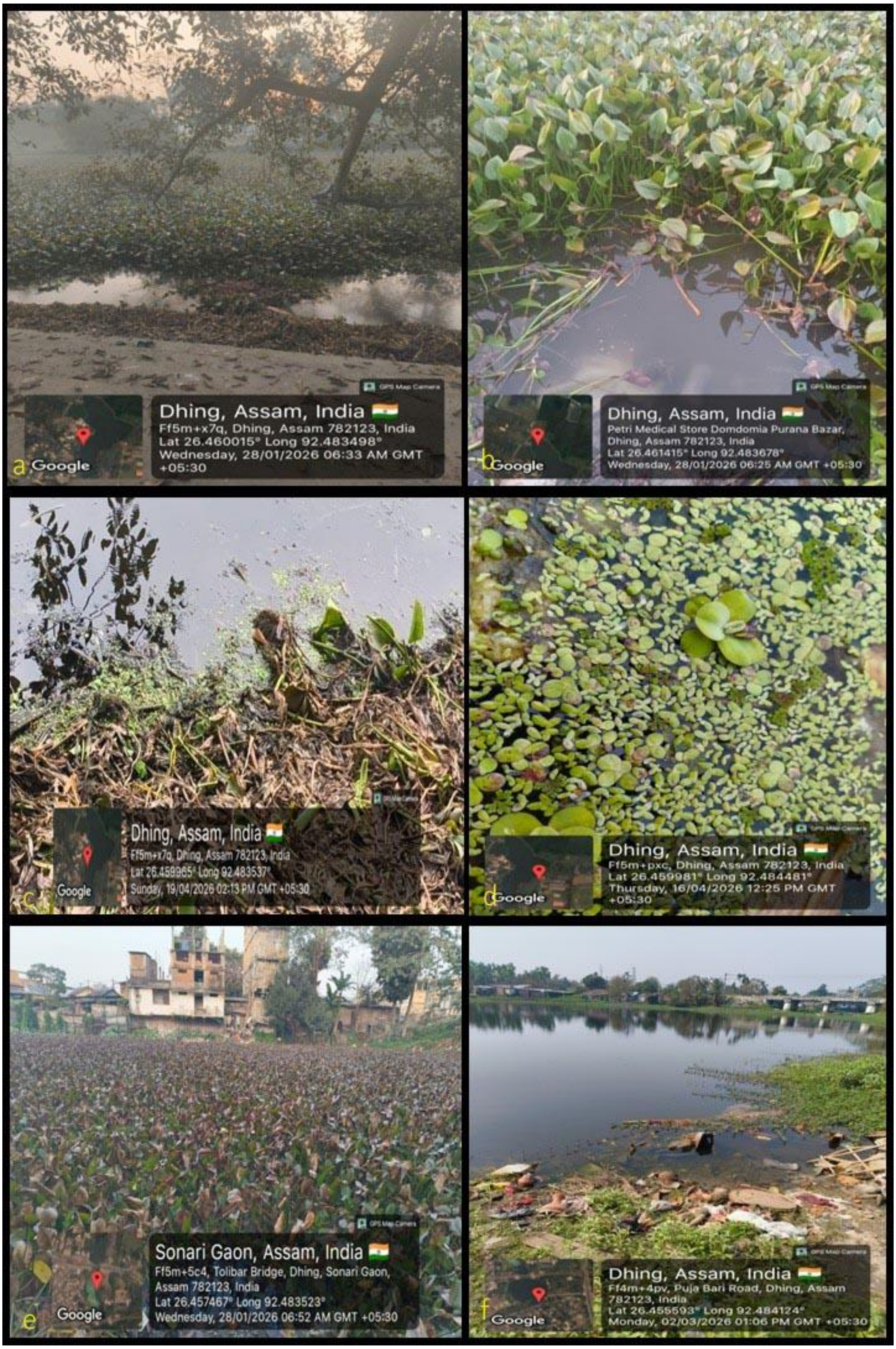

Fig 3: Studied Sites of Talibor Lake, Dhing, Nagaon District, Assam (a. Site -1, b. Site -2, c. Site -3, d. Site-4, e. Site-4, f. Site-5)

Physico-Chemical Tests for Analysis of Water Quality

1. ***Analysis of pH of water:*** pH is a measure of how acidic or basic water is. The range goes from 0 to 14, with 7 being neutral. A pH of less than 7 indicates acidity, whereas a pH greater than 7 indicates basicity.

pH measures the relative amount of free hydrogen and hydroxyl ions in water. Water with more free hydrogen ions is acidic, whereas water with more free hydroxyl ions is basic.

2. ***Turbidity:*** Suspension of particles in water that interferes with the passage of light is called turbidity. Turbid water is undesirable from an aesthetic point of view in drinking water supplies and may also affect products in industries. Turbidity measures the ability of water to transmit light, which restricts light penetration and photosynthesis [7].
3. ***Hardness of Water:*** Water hardness is the traditional measure of the capacity of water to react with soap; hard water requires a considerable amount of soap to produce lather. Hardness of water is not a specific constituent but a variable and complex mixture of cations and anions. The principal hardness-causing ions are calcium and magnesium.
4. ***Chloride Test:*** Chlorides are widely distributed as salts of calcium, sodium, and potassium in water. A chloride test measures the concentration of chloride ions, usually derived from salt, to assess water potability, pollution levels, and corrosiveness. The amount of chloride present in water can be determined by titrating the given water sample with silver nitrate solution.
5. ***Alkalinity:*** Alkalinity is a measure of the capacity of water to absorb H+ ions without a significant change in pH. In other words, alkalinity is a measure of water's capacity to neutralize acids, primarily through compounds such as bicarbonates, carbonates, and hydroxides. It serves as a vital pH buffer, stabilizing water against sudden shifts in acidity.
6. ***Dissolved Oxygen (DO):*** The term DO describes the amount of oxygen dissolved in a unit volume of water. Dissolved oxygen is essential for maintaining healthy lakes and rivers and is a measure of the ability of water to sustain aquatic life. The DO content of water is influenced by source, temperature, treatment, and chemical or biological processes taking place in the distribution system. The presence of oxygen in water is a good sign. Depletion of dissolved oxygen in water supplies can encourage microbial reduction of nitrate to nitrite and sulphate to sulphide. It can also increase the concentration of ferrous ions in solution, with subsequent discoloration when the water is aerated. Hence, DO analysis is an important step in water pollution assessment. Various methods are available to measure DO, including Winkler's method. A minimum DO level of 4 to 5 mg/L or ppm is desirable for the survival of aquatic life.
7. ***Biochemical Oxygen Demand (BOD):*** Biochemical oxygen demand is a chemical procedure for determining the amount of dissolved oxygen needed by aerobic organisms in a water body to break down the organic materials present in a given water sample at a certain temperature over a specific period of time. BOD of polluted water is the amount of oxygen required for the biological decomposition of dissolved organic matter under standard conditions at a standard time and temperature. Usually, the time is taken as 5 days, and the temperature is 20 °C.

Results and Discussion

The statistical data based on the comparative study of different study sites show that the water quality of Talibor Lake is low because rapid urbanization has triggered growth in wastewater production. Discharge of untreated sewage and agricultural runoff brings toxic substances and nutrients that degrade water quality. Table 2 shows the physicochemical data of water samples collected from different study sites, and Figure 4 represents BOD levels at the five study sites.

Table 2. Physico-Chemical Tests of Water Samples

Sl. No.	Sample collecting sites	Protocol used	pH	Turbidity (NTU)	Hardness (mg/L)	Chloride (mg/L)	Alkalinity (mg/L)	Dissolved Oxygen (DO) (mg/L)	Biochemical Oxygen Demand (BOD) (mg/L)
1	Chatt Puja side of Talibor Lake	IS-3025 Pt 11	6.68	11.4	187	20	92	3.82	2.17
2	Agriculture side of Talibor Lake	IS-3025 Pt 10	6.73	10.8	204	24	80	5.84	1.88

3	Jagannath Mandir side of Talibor Lake	IS-3025 Pt 21	6.47	17.4	174	16	86	4.18	2.15
4	Dhing Market area of Talibor Lake	IS-3025 Pt 32	6.54	10.2	198	28	78	3.56	2.31
5	Pujabari Bisharjan Ghat side of Talibor Lake	IS-3025 Pt 23	6.63	14.7	182	22	84	4.08	1.58

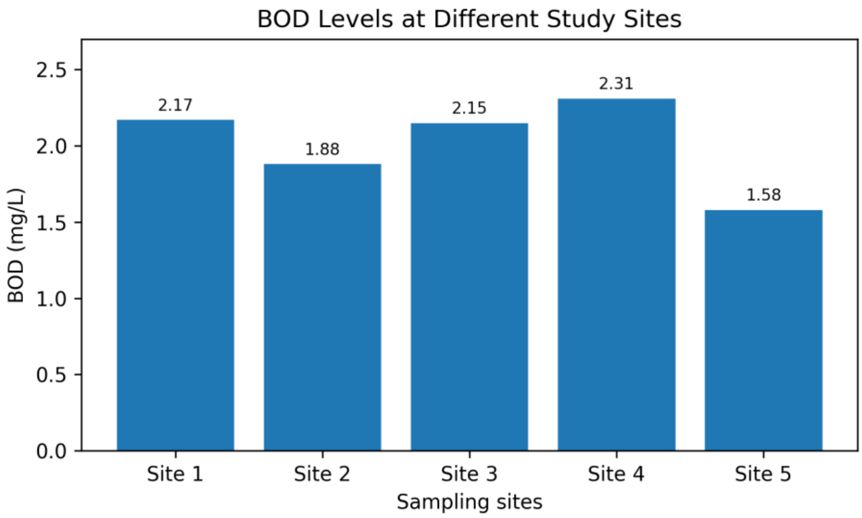

Fig 4: *Graphical Representation of BOD Levels at Different Study Sites*

In the present investigation, the observed and identified surface water aquatic macrophyte community from Talibor Lake of Dhing in Nagaon District of Assam is represented by seven genera belonging to five different families, as shown in Table 3.

Table 3. List of Identified Surface Water Aquatic Macrophytes

Sites	Name of aquatic plants (macrophytes)	Family
Site 1	*Eichhornia crassipes* (Mart.)	Pontederiaceae
	Pistia species	Araceae
	Salvinia natans	Salviniaceae
	Azolla species	Salviniaceae
	Lemna minor	Araceae
Site 2	*Eichhornia crassipes* (Mart.)	Pontederiaceae
	Pistia species	Araceae
	Salvinia natans	Salviniaceae
	Azolla species	Salviniaceae
	Lemna minor	Araceae
Site 3	*Eichhornia crassipes* (Mart.)	Pontederiaceae
	Pistia species	Araceae
	Salvinia natans	Salviniaceae
	Azolla species	Salviniaceae
	Lemna minor	Araceae
Site 4	*Eichhornia crassipes* (Mart.)	Pontederiaceae

	Enhydra fluctuans	Asteraceae
Site 5	*Pistia species*	Araceae
	Salvinia natans	Salviniaceae
	Azolla species	Salviniaceae
	Alternanthera philoxeroides	Amaranthaceae

The ecological classification of aquatic macrophytes in Talibor Lake, Dhing, shows dominance of invasive species, with Eichhornia crassipes covering nearly 90% of the lake's surface. Water samples were collected from five sites: Chatt Puja side, Agriculture side, Jagannath Mandir side, Dhing Market area, and Puja Bari Bisharjan Ghat side. The samples were evaluated for physicochemical parameters such as pH, turbidity, hardness, chloride, alkalinity, dissolved oxygen (DO), and biochemical oxygen demand (BOD). The pH ranged from 6.47 to 6.73, favoring the growth of macrophytes such as Azolla, Lemna minor, Pistia, Salvinia, and Eichhornia. Turbidity values varied between 10.2 NTU and 17.4 NTU, with higher levels at Jagannath Mandir side due to runoff and ritual activities, while lower values at the Agriculture and Market sides indicated clearer water. Hardness ranged from 174 to 204 mg/L, supporting aquatic vegetation through calcium and magnesium availability, though higher hardness may influence nutrient precipitation.

Chloride concentrations ranged from 16 to 28 mg/L, with the lowest value at Jagannath Mandir side and the highest at Dhing Market area, suggesting minimal sewage or industrial contamination. Alkalinity values between 78 and 92 mg/L indicated moderate buffering capacity, stabilizing pH and ensuring carbon availability for photosynthesis. Dissolved oxygen levels varied from 3.56 to 5.84 mg/L, with the Agriculture side showing the highest DO and healthier aquatic conditions, while the Market area recorded the lowest value, likely due to organic matter decomposition. BOD values ranged from 1.58 to 2.31 mg/L, with higher levels at the Market side correlating with lower DO and reflecting increased microbial activity. These findings highlight localized stress but generally favorable water quality for aquatic macrophytes.

Overall, Talibor Lake maintains moderately suitable conditions for freshwater vegetation, with physicochemical parameters supporting species such as Azolla, Lemna minor, Pistia, Salvinia, Eichhornia, Enhydra fluctuans, and Alternanthera philoxeroides. The Agriculture side demonstrated relatively healthier water quality, while the Dhing Market area showed signs of higher organic load and oxygen depletion. Despite these variations, the lake ecosystem is not severely contaminated, as evidenced by low BOD and moderate chloride levels, and it continues to sustain aquatic plant productivity and ecological functioning.

Conclusion

Water pollution is a major environmental concern worldwide. Both macro- and micro-flora groups are highly affected by organic pollutants, and aquatic life is decreasing day by day due to water pollution. The water conditions identified through physico-chemical tests are primarily responsible for the growth of macrophytes in the lake. These plants naturally thrive under such conditions and develop quickly by absorbing required minerals and materials from the water. Many of these macrophytes are aquatic weeds and invasive species, so they spread rapidly. Overgrowth of macrophytes can lead to major ecological issues, and fish and other aquatic life may suffer if dense vegetation prevents sunlight from reaching deeper areas of the water. In addition, these plants serve as phytoremediation agents by absorbing excess nutrients and contaminants from the water. As a result, macrophytes can have both positive and negative consequences. They can be used for pollution control and environmental management in certain circumstances, but in others, their expansion should be restrained to preserve ecological balance.

Conflict of Interest

The authors declare no conflict of interest regarding this paper's content, authorship, or publication.

References

[1] Mendie U. *The Nature of Water: The Theory and Practice of Clean Water Production for Domestic and Industrial Use*. Lagos: Lacto-Medals Publishers; 2005. p. 1-21.

[2.] Aremu MO, Ozonyia GN, Ikokoh PP. Physico-chemical properties of well, borehole and stream waters in Kubwa, Bwari Area Council, FCT, Nigeria. *Electronic Journal of Environmental, Agricultural and Food Chemistry*. 2011;10:2296-2304.

[3.] Edokpayi JN, Makungo R, Mathivha F, Rivers N, Volenzo T, Odiyo JO. Influence of global climate change on water resources in South Africa: toward an adaptive management approach. In: Singh P, Milshina Y, Tian K, Gusain D, Bassin JP, editors. *Water Conservation and Wastewater Treatment in BRICS Nations*. Amsterdam: Elsevier; 2020. p. 83-115. https://doi.org/10.1016/B978-0-12-818339-7.00005-9

[4.] Council for Scientific and Industrial Research (CSIR). *A CSIR Perspective on Water in South Africa - 2010*. Pretoria: CSIR; 2010. CSIR Report No. CSIR/NRE/PW/IR/2011/0012/A. ISBN: 978-0-7988-5595-2. Available online

[5] Razmkhah H, Abrishamchi A, Torkian A. Evaluation of spatial and temporal variation in water quality by pattern recognition techniques: a case study on Jajrood River (Tehran, Iran). *Journal of Environmental Management*. 2010;91(4):852-860. https://doi.org/10.1016/j.jenvman.2009.11.001

[6.] Zhao J, Fu G, Lei K, Li YW. Multivariate analysis of surface water quality in the Three Gorges area of China and implications for water management. *Journal of Environmental Sciences*. 2011;23(9):1460-1471. https://doi.org/10.1016/S1001-0742(10)60599-2

[7.] Agbaire PO, Akporido SO, Emoyan OO. Determination of some physicochemical parameters of water from artificial concrete fish ponds in Abraka and its environs, Delta State, Nigeria. *International Journal of Plant, Animal and Environmental Sciences*. 2015;5(3):70-76. Available online