**“Status of water collected from different ponds of Barishal University”**

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**Abstract**

The purpose of this study is to examine the quality of water collected from several ponds near Barishal University using important water quality criteria. Water quality is a crucial concern for both human health and environmental sustainability, especially in areas where water supplies are under growing demand from anthropogenic activity. This study, which analyzes water samples from several ponds around the institution, gives vital insights into the present level of water quality in the surrounding environment.

The experimental results include a wide variety of parameters, including pH, dissolved oxygen (DO) concentrations, electrical conductivity (EC), chloride levels, and total dissolved solids. These characteristics were tested and compared to regulatory requirements established by the Bangladesh Department of Environment (DoE) and worldwide guidelines issued by the World Health Organization (WHO). The research uses comparative analysis to assess compliance with existing criteria, identify possible areas of concern, and offer methods for successful water quality management.

The findings show varied water quality in the ponds, with low DO levels suggesting insufficient oxygen availability for aquatic life and high EC values indicating contamination. Addressing these challenges enables stakeholders to take specific activities to enhance water quality while safeguarding human health and the environment.

This study enhances understanding of local water quality dynamics, emphasizes proactive water management, and promotes collaboration among academics, politicians, and communities for long-term water resource management plans..

**Key Points:**

1. Status
2. Water
3. Ponds
4. Quality
5. Evaluation

**Acknowledgement**

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**Introduction:** Water is an essential resource that keeps ecosystems alive and supports a range of human endeavors, such as residential usage, industry, and agriculture. In the case of Barishal campus, knowing the quality of water drawn from nearby ponds is essential to maintaining the environmental integrity of the area and guaranteeing the welfare of the campus community. This study examines the condition of water from many ponds around the university with the goal of evaluating its quality according to important water quality criteria.

With the increase in human activity and environmental stresses, monitoring and controlling water quality have become critical jobs. By collecting and analyzing water samples from several ponds, this project aims to shed light on the present status of water quality in the university's vicinity. The comparison of measured parameters to established criteria and recommendations reveals important information about potential environmental dangers and guides focused efforts for water quality improvement.

The experimental data, which includes parameters such as pH, dissolved oxygen (DO), electrical conductivity (EC), chloride levels, and total dissolved solids (TDS), provides a complete picture of water quality in the studied ponds.

Objective of this research is -

* Evaluate the water quality at Barishal University's numerous ponds.
* Provide insights and suggestions for particular activities to improve water quality and promote the health of the university community and the surrounding ecosystem.

This research offers insightful information on the water quality surrounding Barishal University, assisting decision-makers and action takers to safeguard the environment and public health. The research helps to create resilient and sustainable water management methods in the environment of the institution by comprehending the dynamics of local water quality.

# **Method and materials:** The "A Handbook on Analyses of Soil, Plant, and Water" was used to examine all samples. Take care to collect a sample that accurately represents the current circumstances and manage it so that it does not decay or get contaminated before being delivered to the laboratory.

# Rinse the sample vial with the collected water two to three times before filling it. In general, the sampling technique should consider the tests or analyses to be done as well as the purpose for which the data are required.

Keep a record of every sample taken, and identify each bottle, preferably with a properly engraved tag or label. Also, enter the date, hour, exact location, and any other information that may be required for correlation.

The samples used in the experiments are listed below:

1. PH
2. EC
3. DO
4. TDS
5. Cl
6. Free Carbonate
7. Na
8. K

**Apparatus:**

Materials needed for these experiments are:

* 1 liter plastic bottles,
* Marker pen,
* Paper and pen,
* pH meter,
* DO meter,
* EC meter,
* TDS meter,
* Pipettes,
* Volumetric flask,
* Burette,
* Conical flask,
* Titration Stand,
* Flame Photometer

## 

Written by S.M. Imamul Huq and Md. Didar-ul-Alam

## **Reagents:**

Chemical used for these experiments:

1. Standard Silver Nitrate solution (AgNO3), 0.05N
2. K2Cr2O7, 5%
3. NaHCO3, 1%
4. 0.022 N standard NaOH
5. Phenolphthalein indicator

# 

# **Data presentation and statistical analysis:**

For Statistical analysis, we used Microsoft Excell.

Water samples are named as follows:

Sample 1 = Varsity Gate Pond (VG)

Sample 2 = Library Gate Pond (LG)

Sample 3 = Sher E Bangla Hall Pond (SBH)

Sample 4 = Sheikh Hasina Hall Pond (SHH)

* **pH:** We measured the pH of four samples using a pH meter. We took three replicates of each sample and calculated the final reading by averaging the values.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| pH | VG Pond (1) | LG Pond (2) | SBH Pond (3) | SHH Pond (4) |
| Replica 1 | 7.09 | 7.95 | 7.78 | 8.12 |
| Replica 2 | 7.04 | 7.66 | 7.81 | 8.26 |
| Replica 3 | 7.47 | 7.64 | 7.85 | 8.33 |
| Final Reading | **7.20** | **7.75** | **7.81** | **8.24** |

* **Dissolved Oxygen (DO):** We measured the DO of four samples using a DO meter. We took three replicates of each sample and calculated the final reading by averaging the values.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DO (mg/L) | VG Pond (1) | LG Pond (2) | SBH Pond (3) | SHH Pond (4) |
| Replica 1 | 8.87 | 5.45 | 2.22 | 4.97 |
| Replica 2 | 8.91 | 5.64 | 2.77 | 4.67 |
| Replica 3 | 8.92 | 5.04 | 2.67 | 4.83 |
| Final Reading | **8.90** | **5.37** | **2.55** | **4.82** |

* **Electrical Conductivity (EC):** We measured the EC of four samples using an EC meter. We took three replicates of each sample and calculated the final reading by averaging the values.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| EC (μs/cm) | VG Pond (1) | LG Pond (2) | SBH Pond (3) | SHH Pond (4) |
| Replica 1 | 225 | 310 | 604 | 1026 |
| Replica 2 | 222 | 309 | 605 | 1026 |
| Replica 3 | 223 | 309 | 602 | 1027 |
| Final Reading | **223.33** | **309.33** | **603.67** | **1026.33** |

* **Total Dissolved Solids (TDS):** We measured the TDS of four samples using a TDS meter.

|  |  |
| --- | --- |
| TDS (ppm) | |
| VC Gate Pond | 0.18 |
| LG Pond | 0.25 |
| SBH Pond | 0.44 |
| SHH Pond | 0.78 |

* **Chlorides:** Chlorides are one of the major Constituents found in all natural waters in different concentrations. We have estimated this parameter by titration with the AgNO3 solution using K2Cr2O4 as an indicator and Sodium bicarbonate. The computed chloride levels in the water samples were within Bangladesh's acceptable range of 150-600 mg/L, demonstrating conformity with local standards. However, in the absence of a formal WHO recommendation, more analysis is required to identify potential health or environmental consequences.
* Blank titration reading = 0.30

**VC Gate Pond:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SL No. | Initial Reading | Final reading | Difference | Average |
| 1 | 7.5 | 8.8 | 1.3 | 1.26 |
| 2 | 8.6 | 9.9 | 1.1 |
| 3 | 9.9 | 11.1 | 1.2 |

**Calculation:**

% Cl in water

=

=0.030672 ~ 0.031

**Sheikh Hasina Hall Pond:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SL No. | Initial Reading | Final reading | Difference | Average |
| 1 | 5.1 | 6 | 0.9 | 0.83333 |
| 2 | 6 | 6.7 | 0.7 |
| 3 | 6.7 | 7.6 | 0.9 |

**Calculation:**

% Cl in water

=

=0.01819872~0.018

**Shere Bangla Hall Pond:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SL No. | Initial Reading | Final reading | Difference | Average |
| 1 | 6.9 | 7.4 | 0.5 | 0.63333 |
| 2 | 7.4 | 8.1 | 0.7 |
| 3 | 8.7 | 9.4 | 0.7 |

**Calculation:**

% Cl in water

=

=0.01138272~0.011

**Library Gate Pond:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SL No. | Initial Reading | Final reading | Difference | Average |
| 1 | 4 | 5 | 1 | 1 |
| 2 | 5 | 6 | 1 |
| 3 | 6 | 7 | 1 |

**Calculation:**

% Cl in water

=

=0.023856~0.024

* **Free carbon dioxide:**

The CO2 which is found in well waters and surface waters to a great extent can cause corrosion. The CO2 present in water in excess of carbonates and bi-carbonates is known as CO2.

We have estimated this parameter by titration with N NaOH or N KOH solution using as a phenolphthalein indicator.

Blank titration reading = 0.30

**VC Gate Pond:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SL No. | Initial Reading | Final reading | Difference | Average |
| 1 | 3.7 | 5.8 | 2.1 | 2.6 |
| 2 | 5.8 | 8.4 | 2.6 |
| 3 | 8.4 | 11.5 | 3.1 |

**Calculation:**

CO2 mg/l

=

=

= 5.0336 mg/l

**Sheikh Hasina Hall Pond:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SL No. | Initial Reading | Final reading | Difference | Average |
| 1 | 2 | 4.1 | 2.1 | 2.63333 |
| 2 | 4.3 | 7.1 | 2.8 |
| 3 | 7.1 | 10.1 | 3 |

**Calculation:**

CO2 mg/l

=

=

= 5.09168 mg/l

**Shere Bangla Hall Pond:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SL No. | Initial Reading | Final reading | Difference | Average |
| 1 | 10.6 | 12.4 | 1.8 | 1.86667 |
| 2 | 12.4 | 14.2 | 1.8 |
| 3 | 14.2 | 16.2 | 2 |

**Calculation:**

CO2 mg/l

=

=

= 3.62032 mg/l

**Library Gate Pond:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SL No. | Initial Reading | Final reading | Difference | Average |
| 1 | 4 | 6 | 2 | 1.33333 |
| 2 | 6 | 7 | 1 |
| 3 | 7 | 8 | 1 |

**Calculation:**

CO2 mg/l

=

=

= 2.57488 mg/l

* **Potassium (K):** we calculate the absorbance or concentration data of K using a flame photometer by comparing the emission with that from standards made in distilled water containing 0, 5,10,15,20, and 25 ppm of K.

|  |  |
| --- | --- |
| Standard Value (μg/ml) | Absorbance |
| 0 | 0 |
| 5 | 0.06 |
| 10 | 0.11 |
| 15 | 0.16 |
| 20 | 0.22 |
| 25 | 0.25 |

* **Sodium (Na):** we calculate the absorbance or concentration data of Na using a flame photometer by comparing the emission with that from standards made in distilled water containing 0, 5,10,15,20, and 25 ppm of Na.

|  |  |
| --- | --- |
| Standard Value (μg/ml) | Absorbance |
| 0 | 0 |
| 5 | 0.03 |
| 10 | 0.04 |
| 15 | 0.05 |
| 20 | 0.06 |
| 25 | 0.09 |

# **Result and discussion:** Analysis of water samples collected from many ponds near Barishal University yielded valuable information about a range of water quality parameters. Total dissolved solids (TDS), electrical conductivity (EC), pH, dissolved oxygen (DO), and chloride levels are among the characteristics that are examined.

* **PH:** The pH values of the water samples ranged from 7.04 to 8.33 throughout the ponds studied. These readings are within the permissible range for both Bangladesh norms (6.5-8.5) and WHO recommendations, suggesting neutral to slightly alkaline water conditions.
* **Dissolved oxygen (DO):** Dissolved oxygen (DO) values varied across the ponds examined, ranging from 2.22 mg/L to 8.92 mg/L. While some ponds had DO levels appropriate for aquatic ecosystems, others fell below the WHO threshold of 5 mg/L, raising concerns about aquatic ecosystem health.
* **Electrical Conductivity (EC):** The EC values varied from 222 µs/cm to 1027 µs/cm, suggesting differences in the water's conductivity due to dissolved ions. Elevated EC values may indicate pollution from dissolved solids or contaminants, requiring more research.
* **Total Dissolved Solids (TDS):** The TDS levels ranged from 223 ppm to 1026 ppm, with some variability observed among the sampled ponds. While the measured TDS levels appear relatively low, exceeding the Bangladesh standard of 1000 mg/L may indicate contamination from various sources, warranting further investigation.

**Discussion:**

The outcomes of this study emphasize the need of monitoring and controlling water quality in the university's environs in order to maintain human health and environmental integrity. While many characteristics, such as pH and chloride levels, appear to fulfill regulatory limits, there are concerns about low DO concentrations and excessive EC and TDS levels in some ponds.

The observed range in water quality throughout the tested ponds demonstrates the complex dynamics that impact water quality, which include both natural and human effects. Potential causes of pollution, such as agricultural runoff, industrial discharges, and urban activities, should be investigated thoroughly in order to find focused actions for improving water quality.

Recommendations for taking action to improve water quality and promote the health of the university community and surrounding ecology can be made in light of the findings. These might involve creating buffer zones around bodies of water, putting best management practices for land use into effect, and encouraging community involvement and public awareness in water conservation initiatives.

All things considered, this research advances our knowledge of the dynamics affecting local water quality and helps guide evidence-based decisions for sustainable water management techniques within the campus environment. Sustained observation and preemptive actions are necessary to guarantee the water resources' long-term resilience and health in the research region.

**Recommendations:**

* **Regular Monitoring:** To follow changes in water parameters over time and quickly identify emergent concerns, establish a systematic routine for monitoring the quality of the water.
* **Source Identification:** Identify and minimize possible sources of pollution, such as urban activities, industrial discharges, and agricultural runoff, by doing more research.
* **Water Treatment:** To raise dissolved oxygen levels and lower pollution in impacted ponds, use suitable water treatment technologies, such as filtration or aeration systems.
* **Ecosystem Restoration:** To strengthen natural filtration and raise the quality of the water, restore and safeguard the riparian zones and wetland habitats that surround the ponds.
* **Public Awareness:** Spread the word about the value of water conservation and pollution avoidance strategies among the university community and nearby people.
* **Policy Support:** At the local and national levels, advocate for the implementation of laws and regulations aimed at safeguarding water resources and encouraging sustainable water management practices.

Implementing these recommendations will allow stakeholders to work together to improve water quality in the ponds around Barishal campus, assuring the well-being of both the campus community and the surrounding ecology for future generations.

**Conclusion**: The study of water quality in the ponds surrounding Barishal University gives important information about the present health of the local aquatic environment. While certain metrics, such as pH and chloride levels, match regulatory criteria, some ponds have low dissolved oxygen concentrations as well as high electrical conductivity and total dissolved solids levels, raising concerns. These findings highlight the need of taking proactive actions to address possible sources of pollution and protect both human health and the ecosystem.

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