A study on different water quality parameters collected from various water sources of Guwahati, Assam

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Abstract: ***This study aimed to determine water quality parameters of various samples of water collected from three different areas (Azara, Dipor Bil, and Brahmaputra River). Over the due course of time, various physical and chemical parameters regarding the water quality were analyzed for pH, acidity, hardness, DO, BOD, alkalinity etc., using standard techniques in the laboratory and the Bureau of Indian Standards:10500 (Drinking water specifications) was referred to check the acceptability of water. The water samples were collected during the pre monsoon and post monsoon seasons, and their experimental results were compared. Results from the experimental analysis suggests that the collected water sample were not found to be in accordance with the drinking water standards, and from this, we can conclude that the water samples are highly contaminated. Except for the results obtained for the alkalinity test which were found corrosive, the tap water samples were within the standards for the remaining parameters. Whereas, the Dipor Bil and Brahmaputra samples for all the parameters were found to be over the standard guidelines. Hence, more detailed experimental analysis has to be considered to understand how each parameter vary from one another seasonally.***

Keywords**: Water quality Parameters, Physicochemical properties, water sampling.**

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I. INTRODUCTION

Water is one of the most important compound in the ecosystem and contributes to many minerals and nutrients. The health and livelihood of the human being depends on the availability of a safe drinking water source. The source of water is being polluted due to various activities of people. Sources of drinking water are susceptible to a myriad of chemical contaminants, biological pollutants and nuisance water problems that may vary depending on site conditions and other factors. A correlation between the physical, chemical and biological characteristics is possible. Physico-chemical properties and minerals status is an important decisive factor for assessment of drinking water quality. Evaluation of different sources of water collected from different locations is essential for knowing their suitability for drinking purpose. Therefore, this study evaluates the physico-chemical parameters and a comparison of some of these parameters collected during pre and post monsoon season.

II. LITERATURE REVIEW

A. General Introduction

Priyanka Kotoky and Bibhash Sarma have conducted a study to measure the quality of Brahmaputra River of kamrup District, Assam to determine the WQI of the river where it was found that the Brahmaputra river water within the study area is doubtful and not fit for drinking, but might be used for agricultural purposes. This quality of water may cause harm to the aquatic life and aqua-environment. Maintaining the Integrity of the Specifications[1].

An evaluation of Physico – Chemical parameters and minerals status of different water sources at high altitude. was made by Vijay K Bharti, Arup Giri and Krishna Kumar where investigation findings indicated variations in physico-chemical parameters and mineral status of water of different sources. Further, there was a wide variation of water quality constituents among different sources of water. Physical parameters like alkalinity and hardness were higher than WHO standard level at different altitude.[2]

Arivoli Appavu, Sathiamoorthi Thangavelu, Satheeshkumar Muthukannan, Joseph Sahayarayan Jesudoss and Boomi Pandi conducted a study of water quality parameters of Cauvery river water in erode region . The study focused on the determination of physico–chemical parameters such as temperature, ph, EC hardness chlorides, alkalinity, DO, BOD_5 ,COD, phosphate and sulphate of water sample from different sampling points. In the present study water samples were collected from the whole city was divided in four regions for well-organized sampling and interpretation. The

study revealed that how the Cauvery river water is contaminated by effluents from small scale industries and dumping of wastages from markets and domestic use wastages. So water quality management is urgently required to achieve the water quality standards determined by WHO. Correlation coefficient showed highly significant positive and negative relationship.[3]
A study of the impact of Ganesh Idol Immersion Activities on the Water Quality of Tapi River, Surat (Gujarat) India. Was conducted by N.C. Ujjania and Azhar A Multani where it revealed that water quality of Tapi river is ruined due to the immersion of Ganesh idols. It can be concluded that the POP idols after immersion in the River water remains as it is and acts as a slow pollutant. The present research indicates that the pollution burden on river water has increased significantly during idol immersion period which might cause negative impact on aquatic ecosystem.[4]

III. METHODOLOGY

A. Sample Collection

Water samples were collected from the mighty Brahmaputra River, Dipor Bil and Tap Water from Assam Don Bosco University. The Brahmaputra River led Assam to sustain its World Heritage sites and Mega Biodiversity hotspots and has been aptly coined as the 'Life Line' of Assam and Dipor Bil is reported to provide, directly or indirectly, its natural resources for the livelihood of fourteen indigenous villages (1,200 families) located in its precincts. Therefore, these sites play a vital role for Assam's livelihood, wildlife conservation and nature based tourism.

TABLE I. SITE LOCATION

Sample	Location	Latitude	Longitude
A	Tap water	26.1286° N	91.9018° E
B	Dipor Bil	26.1177° N	91.6494° E
C	Brahmaputra	26.1486° N	91.6299° E

B. Tests Performed

- Experiment 1 : pH of water

  pH is a measure of how acidic or basic water is and is important because it controls many chemical and biological processes that occur in the water. As per the Indian Standards, the pH of drinking water should be between 6.5 and 8.5.

- Experiment 2 : Acidity of water

  Acidity of water is important because, it can damage pipes and appliances and it is generally unhealthy to drink. As per the Indian Standards, the permissible limit is 0 mg/l (domestic), 50 mg/l (construction)

- Experiment 3 : Alkalinity test

  Alkalinity is also important considering the treatment of wastewater and drinking water because it influences cleaning processes such as anaerobic digestion. As per the Indian Standards, the desirable limit for alkalinity (as $CaCo_3$ mg/L) is 200 and the permissible limit (as $CaCo_3$ mg/L) should be 600.

- Experiment 4 : Hardness test

  Hardness in water is due to the presence of dissolved salts of calcium and magnesium. It is unfit for drinking, bathing, washing and it also forms scales in boilers. The the desirable limit for hardness (as $CaCO_3$ mg/l) is 300 and the permissible limit (as $CaCO_3$ mg/l) is 600.

- Experiment 5 : Determination of Total solids, Total Dissolved solids and Total Suspended solids etc. in a given sample of water.

  Solid analysis are important in the control of biological and physical waste water treatment processes and for assessing compliance with regulatory agency wastewater effluent limitations. According to WHO standards, the maximum permissible limit for total solids is 500 mg/l, total dissolved solids is 450 mg/l and total suspended solids is 10-50 mg/l.

- Experiment 6 : Determination of Dissolved Oxygen

  The dissolved oxygen content of a water body is one of the most important indicators of its quality. For animals living in water, the water should contain a minimum concentration of dissolved oxygen. Fish require the highest levels and bacteria requires the least. The permissible limit level of dissolved oxygen in most rivers, lakes and stream that required for most aquatic organisms life is at least 5 mg/l. Drinkable water should contain DO value ranges 4 - 6 mg/L.

- Experiment 7 : Biochemical Oxygen Demand test

  The BOD test is important as it measures the amount of oxygen consumed by microorganisms for the process of decomposition of the organic matters in the water bodies. It indicates the amount of organic pollution present in an aquatic ecosystem. The permissible BOD limit is less than 5.0 mg/l for water bodies.

- Experiment 8 : Jar Test For Determining Optimum Coagulant Dosage

  The importance of the jar test is to evaluate and control Coagulation, Flocculation and Sedimentation by finding the optimum coagulant dosage. The acceptable limit of turbidity is 1 NTU and in the absence of an alternate source, the permissible limit is 5 NTU.

IV. RESULTS AND DISCUSSION

TABLE II. COMPARISON BETWEEN TESTS PERFORMED DURING RAINY AND DRY SEASON

Test Performed	Sample	Rainy Season	Dry Season
pH	Sample A (Tap Water)	7	6
	Sample B (Dipor Bil)	7	7
	Sample C (Brahmaputra)	6	6
Alkalinity Test	Sample A (Tap Water)	66 mg/c	108 mg/c
	Sample B (Dipor Bil)	126 mg/c	148 mg/c
	Sample C (Brahmaputra)	88 mg/c	108 mg/c
Hardness Test	Sample A (Tap Water)	45(mg $CaCo_3$/L)	53(mg $CaCo_3$/L)
	Sample B (Dipor Bil)	112(mg $CaCo_3$/L)	89(mg $CaCo_3$/L)
	Sample C (Brahmaputra)	79(mg $CaCo_3$/L)	66(mg $CaCo_3$/L)

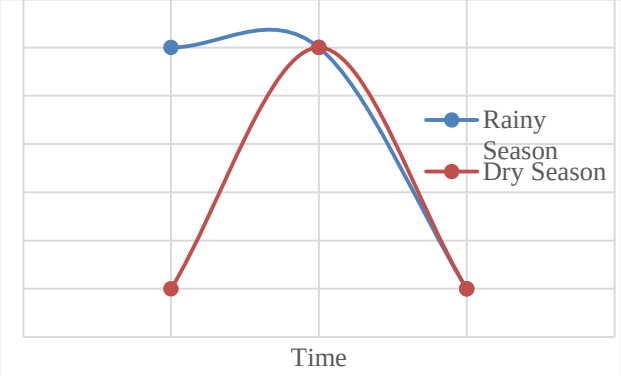

Fig 1 : pH Comparison

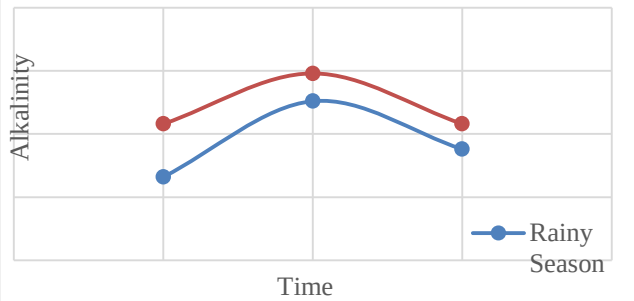

Fig 2: Alkalinity Comparison

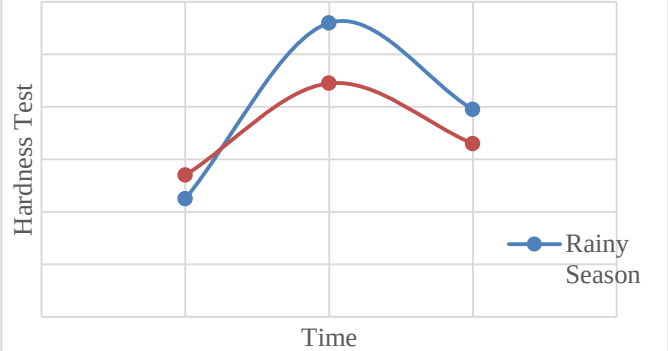

Fig 3: Hardness Test Comparison

TABLE III. OBSERVATION FOR ACIDITY

Test Performed	Sample	Methyl Acidity (mg/l)	Phenolphthalein Acidity (mg/l)
Acidity	Sample A (Tap Water)	0	23
	Sample B (Dipor Bil)	0	15
	Sample C (Brahmaputra)	0	9

TABLE IV. OBSERVATION TABLE FOR TOTAL SOLIDS, TOTAL DISSOLVED SOLIDS AND TOTAL SUSPENDED SOLIDS

Test Performed	Sample	Total Solids (mg)	Total Suspended Solids (mg)	Total Dissolved Solids (mg)
Determination of Total solids, Total Dissolved solids and Total Suspended solids etc. in a given sample of water.	Sample A (Tap Water)	166.66	33.33	100.00
	Sample B (Dipor Bil)	733.33	266.66	433.33
	Sample C (Brahmaputra)	1466.66	433.33	933.33

TABLE V. OBSERVATION TABLE FOR DISSOLVED OXYGEN

Test Performed	Sample	Average Volume (mg DO/L)
Determination of Dissolved Oxygen	Sample A (Tap Water)	5
	Sample B (Dipor Bil)	3.1
	Sample C (Brahmaputra)	5.2

TABLE VI. OBSERVATION TABLE FOR BOD

Test Performed	**Sample**	**BOD (mg/l)**
Biochemical Oxygen Demand test	Sample A (Tap Water)	1
	Sample B (Dipor Bil)	4.6
	Sample C (Brahmaputra)	4.2

TABLE VII. OBSERVATION TABLE FOR TURBIDITY

Jar Test For Determining Optimum Coagulant Dosage			
Sl. No.	Alum Dosage(mg/L)	Turbidity (NTU)	
		Sample B (Dipor Bil)	Sample C (Brahmaputra)
1	2	027	132
2	4	022	95
3	6	012	005
4	8	011	011
5	10	010	010
6	12	008	016

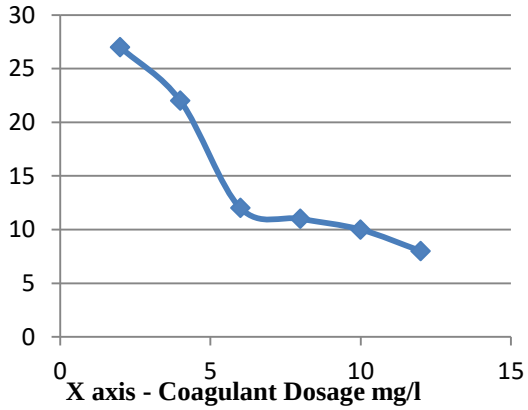

Fig 4: Sample B (Dipor Bil)

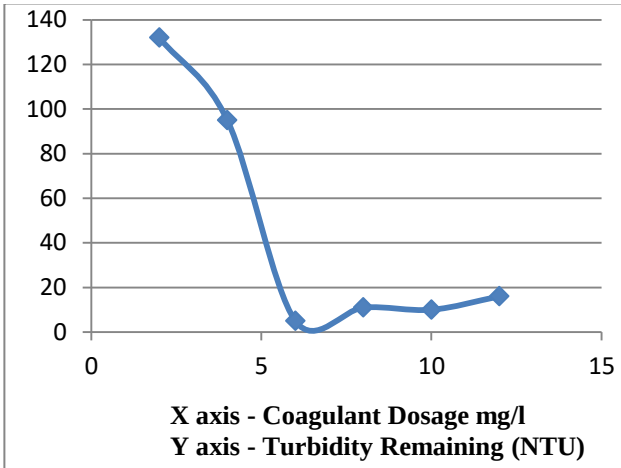

Fig 5: Sample C (Brahmaputra)

V. CONCLUSION

Physicochemical properties and mineral status is an important decisive factor for assessment of drinking water quality. The present study is focused on the determination of physico-chemical parameters such as pH, acidity, alkalinity, hardness, total solids, dissolved oxygen, BOD, etc., The study revealed all the samples : sample A (Tap water), sample B (Dipor Bil) and sample C (Brahmaputra) is not fit for drinking.

Except for the results obtained for the alkalinity test which were found corrosive, the tap water samples were within the standards for the remaining parameters. Whereas, the Dipor Bil and Brahmaputra samples for all the parameters were found to be over the standard guidelines. Hence, more detailed experimental analysis has to be considered to understand how each parameter vary from one another seasonally.

It can be concluded that some of the parameters for sample A (Tap water) is within the acceptable limit whereas the parameters for sample B (Dipor Bil) and sample C (Brahmaputra) are above the acceptable limit. Therefore, the water sources of sample B and sample C are more contaminated than sample A. This is due to proliferation of human settlements, roads, and industries like brick industry and soil cutting around the periphery, waste water from different parts and the adjoining areas, disposal of different solid waste in the water body, etc.

From the obtaining data, we can come to know that all the water of the places are needed to be purified by general or engineered way by using potash, lime, alum or bleaching powder or by aeration and filtering. But still there are lots of parameters like potassium, nitrogen, mercury, COD, BOD and different particle can be present there. So there is a further scope for examining the water quality of the places. Since, people use water from places like Dipor Bil, Brahmaputra etc., so it is very much important to take some steps to clean it with the help of public awareness or during use or supply, it must be purified before it is used.

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References

[1] Kotoky, P.; Sarma, B. Assessment of Water Quality Index of he Brahmaputra River of Guwahati City of Kamrup District of Assam, India. *Int. J. Eng. Res. Technol.* **2017**, *6* (3), 536–540.

[2] Bharti, V. K.; Giri, A.; Kumar, K. Evaluation of Physico-Chemical Parameters and Minerals Status of Different Water Sources at High Altitude. *Peertechz J. Environ. Eval. Physico-Chemical Parameters Miner. Status Differ. Water Sources High Alt.* **2017**, *2* (10–18). https://doi.org/10.17352/pjest.000007.

[3] Appavu, A.; Thangavelu, S.; Muthukannan, S.; Jesudoss, J.S.; Pandi, B. Study of water quality parameters of Cauvery river water in erode region . *J. Glo. Bios.* **2016**, *6*(9), 4556-4567.

[4] Altaher, H.; Elqada, E.; Omar, W. Pretreatment of Wastewater Streams from Petroleum / Petrochemical Industries Using Coagulation. *Adv. Chem. Eng. Sci.* **2011**, *1*, 245–251. https://doi.org/10.4236/aces.2011.14035.

[5] N.B.Prakash; Sockan, V.; P.Jayakaran. Waste Water Treatment by Coagulation and Flocculation. *Int. J. Eng. Sci. Innov. Technol.* **2014**, *3* (2), 479–484.

[6] Nath, S.; Drema, T.; Chonzom, T.; Longkumar, I. Performance Studies of Alum in Waste Water Treatment. *ADBU-Journal Eng. Technol.* **2016**, *4* (1), 73–75.

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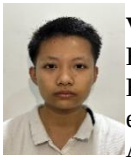

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