P: ISSN NO.: 2394-0344 RNI No.UPBIL/2016/67980 VOL-1* ISSUE-10* January- 2017
E: ISSN NO.: 2455-0817 *Remarking An Analisation*

A Study to Assess the Physico-Chemical Parameters of Different Fresh Water Ponds of Guwahati, Assam

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Abstract

Rapidly expanding cities, industrialization, increased dependency on chemicals and massive production of waste and waste water has resulted in deterioration of the water bodies**.**The present study deals with the variation in physico-chemical characteristics of water in different ponds of Guwahati, Assam. The physico-chemical parameters which are used for the study purpose are air temperature and watertemperature, p^H, alkalinity, dissolved oxygen, free CO_2, hardness, chlorinity and salinity. In the study it was found that dissolved oxygen is highest in Jorpukhuri 1, whereas, the hardness, free CO2, alkalinity and chlorinity and salinity of Borisola beel were highest among the 5 water bodies that were studied indicating that the water bodies are polluted. The p^H level of all the selected water bodies in Guwahati is found to be 7 to 8.5, which is desirable limit of p^H in a fresh water ecosystem.

Keywords: Physico-Chemical Parameters, Ponds

Introduction

Ponds are valuable sourceof water for the people. The quality of ground water depends on various chemical constituents and their concentration, which are mostly derived from the geological data of the particular region.Industrial waste and the municipal solid waste have emerged as one of the leading cause of pollution of surface and ground water. In many parts of the country ponds water are not suitable for living of aquatic organisms because of the presence of heavy metal and polluted substances in excess. Thus there is a need to look for some useful indicators, both chemical and physical, which can be used to improve the quality of fresh water ponds.In context of present era we can say that water and its quality plays a pivotal role on each and every living individual. Characteristics of water bodies influence the quality of water individually and in combination with various pollutants, there by affecting the living organisms present there (Srivastava et al., 2003) [7].The water for aquatic organisms should be free from toxic elements and excessive amount of minerals that may be harmful to health. Keeping this in focus, the quality aspects of pond water in Guwahati area were analysed for the quality of water.

Many authors have studied various physico-chemical parameters of different water bodies of the country to assess their water quality [2]-[8].In this paper a comparative study of the water quality of Dighalipukhuri, Jor pukhuri-1, Jor pukhuri-2, Nakata pukhuri and Borisolabeel has been carried out. All these water bodies are of different nature and importance, as the water is used for different purposes.

Study Site

Guwahati is the largest city of Assam with a population of 9, 63,429 according to 2011 census. It is said to be the gateway of North-East region. The situation of the Guwahati city is at 26°10"N latitude and 94° 49E longitude. The average elevation of this valley is about 52 m from the mid sea level. The study site Jorpukhuri-1 and Jorpukhuri-2 are located in Uzan bazar area with 26°189"N latitude and 91° 754E longitude, the Dighalipukhuri and Nakkatapukhuri are located in Panbazar area with 26°188"N latitude and 91° 74E longitude, and Borisolabeel is located at Paltan bazar area. The mean minimum and maximum temperature of the city varies from 20°C to 37°C.

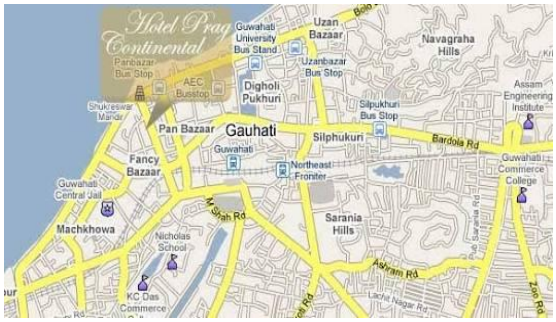

Fig.1: Map of the Location of the Ponds in Guwahati Area

Materials and Methods

The collected samples were analysed for major physical and chemical water quality. Physico-chemical parameters such as Air temperature (AT), Water temperature (WT), pH, Dissolved oxygen (DO_2), Free CO_2, hardness, Total alkalinity (TA), chlorinity and salinity were analysed by standard methods[1].

Table 1 Methods used for Analysis of Quality Parameters for Water Samples

Parameters Studied	Methods Used
pH	Recorded by pH meter
Water Temperature (WT)	Thermometer
Air Temperature (AT)	Barometer
Dissolved Oxygen (DO_2)	Modified Winkler's methods
Free CO_2	Phenolphthalein was used as indicator
Chlorinity and salinity	Potassium chromate was used as indicator
Total Alkalinity (TA)	Neutralising with standard HCl
Total Hardness (TH)	EDTA titration

Aim of the Study

Assessment of water quality in terms of physico-chemical parameters- Ph, Water temperature, Air temperature, dissolved O_2, free CO_2, alkalinity, hardness and chlorinity and salinity.

Result and Findings

Water pH

pH is the negative logarithm of the hydrogen ion activity.The pH of natural water is generally between 6 and 8.pH of water varies due to the hydrolysis of salts of strong bases and weak acids or vice versa. Dissolved gases like carbon dioxide, Hydrogen sulphide, ammonia etc. also affect the pH of thewater. The pH of water was found to be between 7.5 to 8.9 for all the water bodies.

Water Temperature (WT)

Temperature influences the rate of chemical and biochemical reactions in water hence it is very important. Rise in temperature of water decreases the solubility of gases and amplifies the tastes and odour. The temperature of the water samples noted was 24°-28°C.

Air Temperature (At)

The air temperature is between 28 to 30 C. Month wise average highest temperature is in May and lowest is in February.

Dissolved Oxygen (Do_2)

Dissolved oxygen content is one of the most important factors limiting productivity in pond water. The DO_2 is higher in Jorpukhuri-1 ranging from 7.8-9.2mg/l, followed by Nakkatapukhuri (8-8.9mg/l) and Dighalipukhuri (4.4-8.6mg/l). It was found to be low in Borisola beel.

Free CO_2

CO_2 content in water is another factor related with primary production as it is one ofthe basic raw materials for photosynthesis. The free CO_2 was found to be higher in Borisola beel (4-8mg/l) followed by Jor pukhuri-2 (0.0-3mg/l). This may be due to the presence of more zooplankton populations in comparison to phytoplankton. Again in Dighalipukhuri no free CO_2 is found. This may be due to presence of algae.

Chlorinity and Salinity

Dissolved salts are present in all the natural water bodies. In our study high chlorinity and salinity ranges from 7.9 to 72.3mg/l. high chlorinity value is found in Borisola beel (65.7-72.3mg/l) followed by Nakkatapukhuri(43-62.2mg/l). the lowest value of chlorinity is found in Dighalipukhuri (15-18.5mg/l). The chlorinity and salinity of water bodies affect the rate of osmoregulation of aquatic fauna.

Total Alkalinity (TA)

Alkalinity of water is its capacity to neutralize a strong acid and is characterised by the presence of hydroxyl ion capable of combining with hydrogen ion. Slight alkaline water supports biological production.

Total Hardness (TH)

The hardness is caused due to the presence of multivalent cations mainly calcium and magnesium. The bicarbonates, chlorides and sulphates of calcium and magnesium impart hardness to the water. Hardness is expressed in terms of calcium carbonate equivalent (ppm or mg/L). It was found to be between 86.25 to 176.25 mg/L which is 100mg/l compared to WHO standards but is well within the limits of ISI standards which is 300mg/l.

Table 2 The Physic-Chemical Parameters of the Water Bodies

Parameters	Dighalipukhuri	Jor pukhuri-1	Jor pukhuri-2	Nakkatapukhuri	Borisolabeel
pH	8	8.9	8.3	8.5	7.5
Water Temperature (WT)	26.5	26	26.1	27.3	25.75
Air Temperature (AT)	31.4	30.5	31.2	31.65	31.57
Dissolved Oxygen(DO)	7.2	13.4	7.2	8.62	3.85
Free CO2	-	1	1.75	0.275	6.5
Chlorinity and salinity	16.84	46.3	56.2	52.96	69.98
Total Alkalinity (TA)	4.3	5.9	7.575	8.1	9.275
Total Hardness (TH)	86.25	132.5	170.25	108	176.25

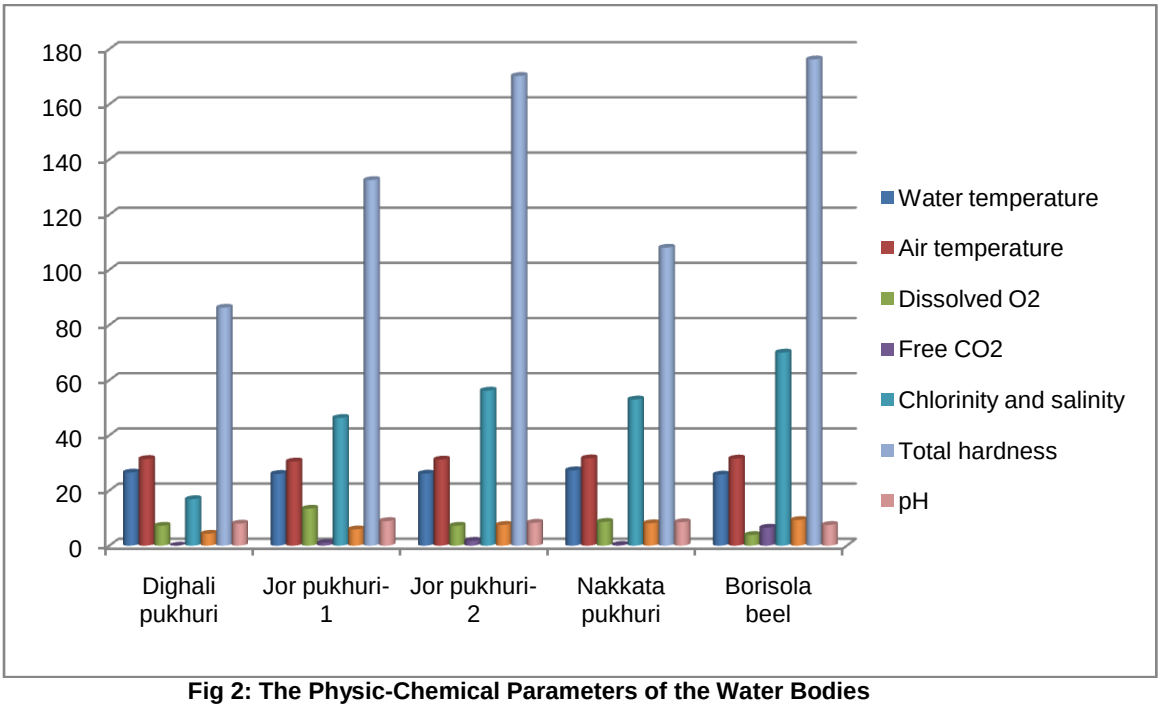

Fig 2: The Physic-Chemical Parameters of the Water Bodies

Discussion and Suggestion

The water bodies that were studied in the present work showed varied levels of pollutants in them. The water of some of the studied ponds is not fit for living for the aquatic organisms. With dark colour of water and unpleasant odour Borisolabeel is highly polluted since it receives the sewage of the city. The sewage must be treated properly before discharging it into the water body. The water of Dighalipukhuri is least polluted water body since there is no significant source of water pollution close to the water body. Nakkatapuhuri on the other hand shows expected result as it carries waste water as the waste materials of a restaurant located at its bank throws waste materials in the pond. Jor pukhuri-1 and Jor pukhuri-2 are not much polluted. So from the above study it can be concluded that the water bodies of Guwahati require restoration and proper and timely monitoring to surmount the on-going contamination in them.

The study will also help in bringing awareness among the people living near the ponds to keep their environment clean and green.An assessment of the aquatic macro invertebrates can also provide an indication of water quality

Conclusion

From the above study, it has been observed that the water quality parameters like air temperature, water temperature, pH, dissolved oxygen, free carbon-dioxide, alkalinity, hardness and chlorinity and salinity lies within the maximum permissible limit prescribed by WHO. However some water bodies are polluted and some are found not much polluted. This type of study may also be helpful to further research on aquatic organisms.

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