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Analysis of Water Quality of Pond Water of Berhampur Town, Odisha

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ABSTRACT

The present investigation deals with the study of quality of pond water. Pond water samples were collected from 10 different ponds of Berhampur municipality Ganjam district to measure their physical and chemical properties. Samples were analysed for physicochemical parameters including temperature ,p^H, Total dissolved solid(TDS),Total suspended solid(TSS), Redox potential, Dissolved oxygen(DO),Biological oxygen demand(BOD), Total hardness, Total alkalinity, Chloride, Nitrate, Phosphorus. The temperature ,p^H, Redox potential, Phosphorus, Nitrates were found normal range but other parameters like TDS, TSS, Alkalinity were found to very low where as DO, Chloride, BOD were found to be very high.

In the present study among the 10 Ponds ,Bhairabi pond, Industrial pond, Rukmini pond were highly polluted because many parameters like DO, BOD, Chloride were found to be very high than the other ponds. So, these ponds are unsafe for human use like washing, bathing and other uses.

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INTRODUCTION :

Life on the earth is never possible without water. Water is one of the most essential constituents of the environment. We need water to drink, to wash our bodies and clothes ,to cook our food and grow crops, vegetables and fruits. Fresh water is finite resource, essential for agriculture, industry and human existence. Without freshwater of adequate quantity and quality sustainable development will not be possible.

Water plays an essential role in human life. The WHO report showed that,approximately 36% of urban and 65% of rural Indian were without access to safe drinking water. The physical and chemical characteristics of the pond water are major determinants of biogenic productivity. The solid, liquid and gasses which support the life processes constitute the abiotic component. Various physical characteristics of water such as temperature and light play a great role in the overall metabolism of the water body while chemical factors like dissolved gases, bicarbonates, nitrogen, phosphorus, silicon, calcium, magnesium etc largely govern its productivity .

The study on Physiochemical analysis of water has a great significance during this age where pollution is on its high range. Water quality evolution for wetland leads to information about their misuse by indicating the pollution states.[1] The physiochemical parameter of the pond have been shown to influence rate of biodegradation in the pond. Temperature has a direct effect on important factors such as growth, oxygen demand, food, requirement and food conservation efficiency. The total suspended solid and total dissolved solid plays important role in determining the solid particle present in water .Increase in phosphate of village pond may be attributed to high organic load of the ponds causing higher level of BOD(biological oxygen demand);COD(chemical oxygen demand) is used to measure the content of organic matter of the pond water.

The study of different physic chemical parameter is very important for understanding the metabolic event in aquatic ecosystem. The parameters influence each other and govern the distribution and abundance of flora and fauna.[2]

The present work deals with physico-chemical analysis of water samples of ten ponds located in Berhampur town with an aim to check the quality of water, and whether it is safe for bathing, washing and other uses or not by the comparative physico-chemical analysis of water samples using standard methods.

REVIEW OF LITERATURE

It has been reported[3] that the constant discharge of sewage into the aquatic system enriches the organic content, leading to eutrophication deterioration of the quality of water. Water of good quality is required for all living organisms and most water bodies become contaminated by the

incorporation of anthropogenic Sources.. The increased demand for water as a consequence of population growth, agriculture and industrial development has made the environmentalist to determine the physical, chemical and biological features of all water resources[4]. The high amount of chloride was recorded during summer and low values were observed during monsoon decreasing chloride may be due to increased temperature and evaporation of water bodies as reported [5] .

It has been explained by authors[6] that, in order to understand the water quality of Triveni Lake, Physico-chemical parameters were studied and analyzed for the period of one year i.e. December 2010 to November 2011. The results revealed that there was significant seasonal variation in some physicochemical parameters and most of the parameters were in normal range and indicated better quality of lake water. It has been found that the water is best for drinking purpose in winter and summer seasons. Water quality assessment of the River Godavari, at Ramkunda Nashik has also has been done[7] .

While reviewing the status of physicochemical characteristics of Pavana River, Pune. It was found that at many places the water is highly polluted. There was an increase in DO and decrease in COD, BOD contents in the water.Water quality and sediment analysis at selected locations of Pavana river of Pune district, Maharashtra" has been investigated [9] to give an insight about the level of contaminants of surface water, groundwater and sediment analysis of selected locations of Pavana river of Pimpri- Chinchwad area of Pune district. An attempt has been made to assess the water quality, sediment and weed analysis of the samples.

MATERIAL AND METHODS

Description of study area

Water samples were collected from TEN different ponds located in Berhampur town in Ganjam district, Odisha, India during December 2017 It is situated at 19.32 North latitude, 84.78 East longitude and 31 meters elevation above the sea level. All the ponds are the source for use of bathing, washing, fishing for local peoples and sometimes drinking purpose and bathing water for cattle.

TABLE- 1: Location of sampling points of water collection in Berhampur Town, Odisha

SI. NO.	LOCATION OF PONDS/ SAMPLING POINTS	CODE NO.
1	Industrial Pond AT Industrial Area	Sample-A
2	Bhairavi Pond AT Ankuli	Sample-B
3	Brahmin Sahi Pond AT Babajitota	Sample-C
4	Haripur Pond AT Haripur	Sample-D
5	Santoshi Maa Pond AT Bijipur	Sample-E
6	Gudi Pond AT Nilakantha Nagar	Sample-F
7	Golapalli Pond NEAR Payal Hall	Sample-G
8	Bana Pond NEAR Lanjipali	Sample-H
9	Ramalingam Pond NEAR Rukmini Hall	Sample-I
10	Kalia Pond NEAR Aska Road	Sample-J

SAMPLING

Samples were collected in 500ml glass bottle for all physicochemical parameters, pre-cleaned by washing with detergent rinsed in tap water. Before sampling, the bottles were rinsed two times with sample water before being filled with the sample. The sampling were done in the morning 8 AM to 10 AM and the containers were dipped and filled at a depth of 25-30 cm below the surface of pond. The Sample was then transported into laboratory and stored in a freeze for further analysis.

CHEMICAL ANALYSIS

Analysis was carried out for various water quality parameters such as Temperature, PH, Redox Potential, TDS, TSS, DO, Total hardness, Total alkalinity, chloride, BOD, Phosphorus and Nitrate. PH, Temperature was determined on the site of collection while other parameters were analysed in the laboratory using standard method. The reagents used for the analysis were of high quality and double distilled water was used for preparation of solutions. All physio-chemical analysis of water was carried out following the standard procedures. [10,11]

RESULTS:

The temperature range in the various pond water samples ranged from 19°c to 23°c and Maximum temperature was observed in sample B, G, H and J and minimum in sample I. Similarly, the pH value ranges from 7.7 to 8.1and maximum was recorded in Sample J and minimum in Sample C. The redox potential ranged from 042 to 068millv.Maximum redox potential Was observed in Sample C where as minimum was observed in Sample J.The TDS ranged from 0.38 to 48.14gm/l.

maximum TDS was observed in Sample D and Minimum TDS observed in Sample C. The TSS ranged from 0.15 to 1.16 gm/l. Maximum TSS was observed in Sample J where as Minimum was in Sample B. The D.O values ranged from 30.027 to 190.172mg/l , maximum Do was recorded in Sample J and minimum was observed in Sample C. The Chloride ranged from 0.025 to 0.965gm/l. Maximum chloride was observed in Sample I and Minimum was in Sample C. In our study alkalinity ranged from 0.014 to 0.610gm/l. Maximum alkalinity was observed in Sample J where as Minimum was in Sample I. In this study Total hardness ranged from 0.013 to 0.105gm/l. Maximum Total hardness was observed in Sample J and Minimum was observed in Sample H. In this study BOD ranged from 0.03 to 6.38mg/l. Maximum BOD was observed in Sample A and Minimum was in Sample D. In this study Nitrate ranged from 0.73 to 1.40mg/l. Maximum nitrate contents was in Sample E where as Minimum was in Sample D. In this study Phosphorus ranges from 0.60 to 0.71mg/l. Maximum phosphorus was observed in Sample D where as Minimum was observed in Sample E.

DISCUSSION

Temperature values in the ponds in the study area ranged from 19°C to 23°C.Maximum temperature was in the sample B,G,H and J and minimum in sample I. It has been reported [12]that, the range of temperature in between 24.75 to 28.5°C.

The permissible limit of p^{H} in drinking water is within 6.5-8.5 according to Bureau of Indian standard (BIS). Water with p^{H} greater than 7.0 is considered basic or alkaline .So above the p^{H} value consider that all water sample s are in alkaline or basic form. It has been reported [13,14] that, the range of p^{H} 6.93 to 7.55 and 7.5 to 8.4 respectively.

Total dissolved solids (TDS) are the total amount of mobile charged ions, including minerals, salts or metal dissolved in a volume of water in mg/l. There is no gas and colloids in TDS. In this investigation the TDS ranged from 0.38gm to 48.14gm per liter. Maximum TDS was in the sample D and minimum was in sample C. Amount of TDS increased due to increased amount of surface run off [15] . It has been reported[13] that, the range of TDS in between 152.12 -265.97gm/l.

The total suspended solids are composed of carbonates, bicarbonate, chloride, phosphate and nitrates of calcium, magnesium, sodium, potassium, manganese, organic matter, salt and particles. TSS ranges from 0.15 to 1.16 g/lit. Maximum TSS was in sample J and minimum was in sample B. The value of total suspended solids falls within the standard range of 0.01 to 0.0186gm/l recommended[16].

Dissolved oxygen is the dissolved gaseous form of oxygen. DO enters water by diffusion from the atmosphere and as a by product of photosynthesis by algae and plants. In this investigation

dissolved oxygen ranged from 30.027 to 190.172 mg/lit. Maximum DO was recorded in sample J and minimum was in sample C. Authors had reported[13] a range of DO 2.43 to 4.45 mg/lit in their study.

Chloride , concentration can be as an important parameter for detection of contamination by sewage. The chloride concentration in the study area ranged from 0.025 to 0.965 gm/lit. Maximum chloride concentration was in sample I and minimum was in the sample C. It has been reported[17] that, chloride concentration ranges between 10-25 mg/l. Alkalinity is a chemical measurement of water's ability to neutralize acid. Bicarbonate represents the major form of alkalinity in natural water. During this study the total alkalinity ranged from 0.014 to 0.016 g/l. Maximum alkalinity was observed in sample J where as minimum was in sample I. The uptake or release of co_2 may changes the proportion of carbonates and bicarbonates in water[18]. It has been classified[19] that, the waters having alkalinity over 100ppm are hard waters. Hardness of water is a measure of its capacity to form precipitate with soap and scales with certain anions presents in the water. Hardness of water mainly depends upon amount of calcium or magnesium salt or both. In this study total hardness ranged from 0.013 to 0.105 g/l. Maximum hardness was observed in sample J and minimum was observed in sample H. Biological oxygen demand is a measure of organic material. Concentration in water , specified in mg/l.BOD is the amount of dissolved oxygen required for the biological decomposition of organic compounds and the oxidation of certain inorganic materials. In our investigation BOD ranged from 0.03 to 6.38 mg/l. Maximum BOD was recorded in sample A and minimum was in the sample D. Accumulation of low BOD results in organisms being stressed , suffocated and death, however permissible limit as reported [20] was 4mg/L.

Nitrate represent the final product of the biochemical oxidation of ammonia. In this study the nitrate content was in the sample 0.73 to 1.40mg/l. Maximum nitrate content in sample E where as minimum was in the sample D. Phosphorus is a limiting nutrient in aquatic system. This means that the relative scarcity of phosphorus may limit the ultimate growth and production of algae and rooted aquatic plants. Phosphorus ranges from 0.60 to 0.71 mg/l. Maximum phosphorus was observed in sample D where as minimum was observed in sample E.

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