PROJECT REPORT ON

PHYSICOCHEMICAL ANALYSIS OF POND WATER FROM PATTAMUNDAI COLLEGE CAMPUS

2020-21

ORGANISED BY
DEPARTMENT OF BOTANY

PATTAMUNDAI COLLEGE
PATTAMUNDAI
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Report

Project on **'Physicochemical analysis of pond water from Pattamundai college campus'** was prepared by students of department of botany during the month of July 2020. Nine number of students were participated in this project work. They collected water samples from the pond of Pattamundai college and gone through different physicochemical analysis. The departmental faculties co-operated them in all these works and this project is original. The project was guided by Mrs. Suchismita Biswal, Lect. in Botany.

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INTRODUCTION

Water is one of our most precious resources. We depend upon it for our livelihoods, healthy ecosystems, and a robust economy.

There are two principal sources of water, surface water and ground water. Surface water comes from ocean, streams, lakes, rivers, Pond etc. Most surface water contains suspended solids, organic and inorganic substances, microbes and other biota. If these substances are present in water in optimum level, they do not cause pollution. Pollution of water is the presence of some foreign organic, inorganic, biological, radiological or physical substances in the water which are hazardous for flora and fauna of that ecosystem. These substances contaminate water by degrading its quality which may cause health hazard or decrease the utility of water. Some substances like industrial poisons, toxic chemicals and pathologic organisms pollute the water even at very low concentrations. Some pollution occurs naturally in the form of soil erosion, deposition of animal wastes and fallen leaves, solution of minerals in water etc. Much of it is the direct result of human activity. As per National water policy, 2002, water resources development and management will have to be planned for a hydrological unit such as drainage basin as a whole or for a sub-basin for sustainable use incorporating quantity and quality aspects as well as environmental considerations. The water environment quality is a very important and is a subject of major concern for economic development of any country. The water resource problems related to degradation have increasingly been serious because of rapid industrialization and urban sprawl. Anthropogenic influences such as urbanization, industrial and agricultural activities, increasing consumption of water resources along with natural process i.e., change in precipitation inputs, erosion, effectively deteriorate surface water quality and impair their uses for drinking, industrial, agriculture, recreating and other purposes.

The study area is located near the Pattamundai town. Pattamundai is located at 20.57°N 86.57°E & 22 km from the Bay of Bengal in the Utkal Plains, at an elevation of 6 m from sea level. Pattamundai is a flat, low-lying delta region in the Lower Mahanadi

River basin. It is a semi urban area situated in Kendrapara district in the Indian state of Odisha, located on the centre of SH-9A from Cuttack to Chandbali along the south end of Brahmani River. The Brahmani river divides it from the Aul block. The Pattamundai Canal running from Cuttack to Alva Lock (80.5 km) constructed by the East India Company during the mid-19th century, is a major irrigation canal passing through the city. The river Brahmani is passing by the side of this municipality and flood water of this river has been inundating over 50% geographical area of this municipality every year.

The project work is done upon the physiochemical analysis of pond water present behind canteen of pattamundai college. It is a small area of still,fresh water and no more around 1.8m deep.

The water in a pond must remain clean if it is to provide a healthy environment for the organisms (animals and plants) living in it. The natural waste from the living and dead organisms is 'recycled' by special tiny organisms called bacteria. Plenty of oxygen is needed for the bacteria to 'break down' the waste. The pond can take care of its own waste – it's people who cause pollution!

Perhaps the most serious threat to ponds is chemical pollution as a result of modern farming methods. Over the years fields have been sprayed with pesticides to rid the crops of pests.

Another, equally serious, problem connected with agriculture is the use of artificial fertilizers. Powdery chemical fertilizers, containing nitrates, are put on the crops to help their growth but they can also be washed off by rain into nearby ponds. They do not poison the wildlife but the rich supply of nitrogen causes the water plants, especially algae, to grow very quickly. The plants use up so much oxygen during the night and during decaying processes that there is none left for the other pond-life. The growth also prevents sunlight reaching the organisms below. Eventually, all the algae die leaving a smelly, decaying mass. The case of excess nitrates in water is called eutrophication.

Another cause for pond water pollution is due to physical wastes like polythene,paper,penetc released from the college campus.

On enquiry it emerged that water has following characteristics.

1.foul smelling

2. heavy growth of Algae

3.Decrease of fish population

It has been proposed to analyze the water quality to find reasons of water problems in the pond.

REVIEW OF LITERATURE

Water quality is a complex subject, which involves physical, chemical, hydrological and biological characteristics of water and their complex and delicate relations. From the user's point of view, the term "water quality" is defined as "those physical, chemical or biological characteristics of water by which the user evaluates the acceptability of water". For example, for drinking water should be pure, wholesome, and potable. Similarly, for irrigation dissolved solids and toxicants are important, for outdoor bathing pathogens are important and water quality is controlled accordingly. Dugan [1972] suggested that all biological reactions occur in water and it is the integrated system of biological metabolic reactions in an aqueous solution that is essential for the maintenance of life. Pani [1986] in his study realized that due to increasing industrialization on one hand and exploding population on the other, the demands of water supply have been increasing tremendously. Moreover, considerable part of this limited quality of water is polluted by sewage, industrial waste and a wide range of synthetic chemicals. Heavy metals are considered as major environmental pollutants and regarded to be Cytotoxic, Mutagenic, and Carcinogenic. The Heavy Metal pollution of natural environment has been consistently increasing through effluents, sedimentation of rocks and mining activities (Manjit [1988]).

Priti Singh et.al [2005] assess and map the spatial distribution of surface water quality of the Mahanadi, Odisha by using GIS. APHA's standard laboratory procedure has been adopted to assess the quality of ground water. The spatial distribution map of pH, Chlorides, Magnesium and sulphate shows that, these parameters are within range as per standard. Samantray et al. were studied the water quality of Mahanadi and its distributaries rivers, streams, Atharabanki river and Taladanda Canal adjoining Paradeep in three different seasons namely summer, pre-monsoon and winter. Their findings highlighted the deterioration of water quality in the rivers due to industrialization and human activities (Samantray et al., 2006). Kamal [2007] carried out on physicochemical parameter of river water affects the biological characteristics and indicates the status of water quality. Different types of Physicochemical parameters of water are pH, DO, BOD, COD, Chloride, TDS, Nitrate, Sulphates, TH, EC and Fluoride. These parameters are solely responsible for water quality. Adetunde et.al [2007] have studied the area and investigated physicochemical and bacteriological qualities of surface water in the north areas and south local government areas of State, Odisha. Water samples were collected from different areas of North and South local areas. Swarna Latha [2008]. High TDS presence in the water decreases the quality and affects the taste of water as found from Guru Prasad, 2005. Chloride is one of the most important parameters in assessing the water quality and higher concentration of chloride indicates higher degree of organic pollution (Yogendra and Puttaiah, 2008). Khare et.al [2010] carried out on water quality assessment of Mahanadi, Sambalpur. He was done water analysis for the parameters like pH, DO, BOD, COD, TDS, calcium, Magnesium and Hardness for water.

Methodology: Materials & Methods for Analysis

Water samples were collected from the pond present behind the canteen of Pattamundai college campus. The sampling strategy was designed to cover determinants at key sites that accurately represent the water environment quality of pond.Various water quality parameters from the monitoring stations were analyzed.

The mean value of the data sets was taken into consideration for evaluating the pollution load in the water system. The measured parameters include pH, temp, Alkalinity, DO, and BOD.

Water samples were collected in plastic bottles from each of these sites.The physical and chemical parameters were estimated according to methods described in standard methods for the examination of water.

Sample Collection and was done in month of March. Manual sampling with a plastic container in compliance with established standard norms was adopted. Labels were used to prevent sample misidentification. Sample preservation was done in tune with guidelines with minimum possible time lapse between collection and analysis.

Methods of Analysis

pH was measured within 2 hr of sample collection because the pH of the sample can change due to carbon dioxide from the air dissolving in the sample water. A pH meter was used for the measurement of pH.

Analysis of Samples Analysis of the collected water samples was done in accordance with the procedures suggested in the Standard Analytical Procedure Manual for water samples which is based on 'Standard Methods for the Examination of Water and Wastewater' 19th edition, APHA, AWWA, wef 1995

Table: 1

Sl.No	Parameter	Method	Instrument/Equipment
1	Temperature	Laboratory method	Thermometer
2	pH	Electrometric	pH meter
3	DO, BOD	Iodometric (Titrimetric)	
4	Alkalinity	Titration with Sulphuric acid	

Table: 2 - Details of solutions and reagents used in analysis

PARAMETER STUDIED	REQUIRED SOLUTIONS
Dissolved Oxygen, BOD	1. 0.025 M Hypo solution 2.Alkali-iodide-azide reagent 3. MnSO4 solution 4. Starch Indicator
Alkalinity	1. 0.1 N Standard sulphuric acid 2. methyl orange indicator 3. 0.5 N Sodium carbonate solution

Experimental Procedures

- Temperature was measured at the time of sample collection with a good mercury filled celsius thermometer, having a scale marked for every 0.1°C.
- pH was measured within 2 hr of sample collection because the pH of the sample can change due to carbon dioxide from the air dissolving in the sample water. pH meter was used for the measurement of pH.
- Alkalinity was determined by acid-base titration method. 20.0 ml of the sample was taken in a 250.0 ml conical flask and titrated with standard 0.1N sulphuric acid by using phenolphthalein and methyl orange 10 indicators. Phenolphthalein alkalinity registered total hydroxide and one half of the carbonate present in the sample. Methyl orange was used to determine total alkalinity.

Total alkalinity, mg $CaCO_3$/ l = AxBx50,000/vol of sample

where A = Volume of acid consumed (ml) with methyl orange as indicator

B = Normality of standard acid solution

- Dissolved Oxygen

1. Collection of samples- The samples were collected using special BOD bottles (glass bottles with a turtle neck and a ground glass stopper). The bottles were directly filled by dipping them in the wells or by filling them up to the brim without any air bubbles. The sample bottle was submerged and allowed to fill without allowing air to mix with the sample. The bottle was completely filled and kept submerged until the cap was firmly in place.
2. Measurement of DO- To the sample collected in 300ml bottle, 1.0ml of 0.414M $MnSO_4$ solution was added followed by 1.0ml alkali-iodide-azide (NaOH, NaI, NaN_3) reagent. The solution was mixed by inverting the bottle a few times. When precipitate had settled sufficiently (to approximately half the bottle volume) 1.0ml conc.H_2SO_4 was added to clear supernatant liquid above the manganese hydroxide flock. The bottle was restoppered and the contents were mixed by inverting several times until dissolution was complete. 200.0ml mixture solution was titrated with 0.025M hypo solution to pale straw colour. A few drops of starch solution were added and titration was continued up to first disappearance of blue colour. For 200.0 ml sample, 1.0ml 0.025M hypo = 1mg DO/l.
3. Biochemical Oxygen Demand (BOD): BOD was also determined titrimetrically by adopting in toto the procedure adopted for the 14 measurement DO but only after incubation for five days at 200C. BOD was then calculated on the basis of oxygen depleted when compared to DO before incubation.

Results and Discussion:

Table-3

Sample no.	Temp (^{0}C)	pH	Total Hardness (mg /l)	Ca (mg/l)	Mg (mg/l)	Total Alkalinity (mg /l)	DO (mg/l)	BOD (mg/l)
1	30	7.4	260	112	52.3	313	5.6	6.2
2	31	7.2	266	120	43.2	330	5.2	6.5
3	29	6.5	265	104	62.4	345	5.1	6.3

- Temperature is around 30°C in month of March.
- The pH values for all the samples ranges from 7.2-6.5
- Alkalinity is the capacity of water to neutralize acid. It is a measure of bicarbonates, carbonates and hydroxides present in water. Total alkalinity of all the samples was found to be higher than permissible value (200mg/l(P) suggested by BIS.
- Dissolved oxygen (DO) levels indicate the ability of water to purify itself through biochemical processes. The permissible level of DO according to BIS as well as WHO standards is 4.6-6.0. The DO ranges from 5.1(mg/l)-5.6(mg/l).
- BOD ranges 5.5(mg/l) to 6.5(mg/l) which shows the water is heavily contaminated by microorganism and algae.

Conclusions & Recommendations:

On the basis of the experimental data obtained, the pond is getting polluted day by day. Now it is totally unfit for both drinking and bathing purpose under BIS standard. Therefore, it is necessary to take necessary steps to reduce pollution load on the ponds otherwise in future these are going to be dead ponds. Agricultural run-off water should not get entry into the pond. In addition, there should be sustained effort by administration and the public in general to create environmental awareness. It is recommended that dumping of all kinds of waste materials into the pond should be stopped immediately to allow the self-purification process of an aquatic system to regain its original condition. It will be better if the ponds are given some purification treatment and renovation including providing fencing around the periphery of the ponds.

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DEPARTMENT: Botany
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SESSION-2020-21

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