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Assessment of Physico-Chemical Parameters of Water from Different Ponds in Karanjia, Odisha

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Abstract: Water is important natural resources for human life and ecosystem. The present research work has focused on assessment of water physico-chemical parameters from seven different ponds present in the Karanjia of Mayurbhanj district, Odisha. All samples are collected from different ponds such as Pradhan pokhari, Rajabandh, karadia, Pradeep sagar, Ankura pokhari, Nata pokhari, and khajurisagar.

People used the water from these ponds for drinking and irrigation purpose. The physico-chemical parameters such as water pH, temperature, dissolved oxygen, conductivity, BOD, hardness, alkalinity and turbidity were analyzed in the water samples. There are seven ponds greatly varied to each other in different properties. All these water bodies are not suitable for human consumption, proper remediation is necessary before their use for drinking purposes. Routine monitoring of these pond waters may provide suitable area for aquatic animals as well as domestic uses.

Keywords: Water, Physico-chemical, Karanjia, monitoring

I. INTRODUCTION

Water is very necessary element for the sustainable environment and without water life might not be existed on the surface of earth [1]. Fresh water is about only 3% of total water present in the universe. About five per cent of fresh water is readily available for beneficial purposes which is equal to 0.15 per cent of all global waters [2]. Less than one percentage of water is used in industries and agricultural fields. Water quality in an aquatic ecosystem is determined by many physical, chemical and biological factors [3]. Physico-chemical properties of water in the reservoirs are affected by uncontrolled discharge of sewage, municipal waste and industrial influents. These additions of influents into pond cause eutrophication of ponds [4].

Physico-chemical properties like pH, conductivity, total alkalinity, hardness of water, salinity, BOD, COD, Turbidity and temperature of water in any aquatic system are largely controlled by the local weather condition. These are essential factors that determine the structural and functional aspects of a pond.

These parameters of water affect the fish productivity as well as faunal biodiversity in the aquatic ecosystem. Electrochemical properties of pond water are mainly reflected by electrical conductivity and pH. Neutral or slightly alkaline pH ranges of water are considered to be suitable conditions for aquaculture as most of nutrient elements and biological activities are increased due to increased biological activities under this pH range [5].

Presence of organic matter present in water samples are measured by one of the parameters like biochemical oxygen demand. The physico-chemical parameters of water are useful for monitoring the distribution of fauna and flora along with their metabolic activities. [6]. This study is giving importance on analysis of some physico-chemical parameters of pond water present in Karanjia town of Mayurbhanj district, Odisha to monitor the status of water.

II. MATERIALS AND METHODS

This study was conducted in Karanjia Town of Mayurbhanj district, present in the northern region of Odisha. This district has occupied with a total geographical area of 10, 418 square kilometres.

The District lies between 21° and 22° North latitude and 85° and 87° East longitude [7]. This study was involved with water bodies including several ponds present in Karanjia town of Mayurbhanj district, Odisha.

These ponds were Pradhan pokhari, Rajabandh, karadia, Pradeep sagar, Ankura pokhari, Nata pokhari, and khajurisagar. These selected areas were varied with aquatic vegetation.

For this experimental analysis seven ponds were selected for this study. Water samples were collected in plastic container from surface water according to standard protocol [8]. After collecting water samples, experimental analysis was done in the laboratory of Centurion University of Technology and Management, Bhubaneswar.

III. METHODOLOGY

For this experimental analysis, the following physic-chemical parameters of water are estimated to monitor the quality of water for sustainability of livelihoods.

A. Estimation of pH

The pH is calibrated with two standard buffer solutions with pH 4 and pH 9. The combined electrode was thoroughly rinsed with double distilled water and wiped carefully. Then electrode was placed into the required water sample to measure the pH of those samples. The water samples continuously swirled and the readings were taken after waiting for one minute.

B. Estimation of Alkalinity

For estimation of alkalinity, 50ml of sample water was taken in a conical flask and 4 drops of phenolphthalein was added to it. Then standard HCl was added from the burette till it becomes colorless. Four drops of methyl orange was added to the same solution in the conical flask. Then HCl is again added in the conical flask till the colour turns to pink.

C. For Dissolved Oxygen

First 300ml of water sample was taken in a bottle and 2ml of manganus sulphate and 2ml of alkaline KI were added by dipping the pipette to the bottom of the bottle.

Then bottle was allowed to stand until the precipitate is settled down to half of the bottle. The bottle was allowed for fixation for 30 minutes.

Then 50ml of the fixed sample was taken in a conical flask and titrated against sodium thiosulphate solution. This resulted in changing of the colour of the solution to straw yellow. Seven drops of starch indicator was added to it. A deep red colour appeared immediately. Then the solution was titrated against sodium thiosulphate solution till the deep red colour vanished completely. The initial and the final burette readings were taken and the differences in the readings were taken and the differences in the reading were noted.

D. Hardness of Water

Burette was cleaned with distilled water then rinsed with EDTA solution then 50ml of EDTA as taken in the burette and fixed to the burette stand. Conical flask was cleaned and 25ml of sample water was taken. To the sample water 0.5ml of buffer followed by 0.5ml of Na₂S solution was added.

To this mixture 0.075mg of EBT was added and mixed properly so that it forms a complex wine red color. Then the complex mixture was titrated against EDTA reagent with continuous mixing. After a certain period the complex wine red color changed in to blue color.

Then initial and final burette reading was measured. This procedure was done for three times to find out the mean of difference of final and initial reading.

E. Temperature

Temperature is an important physical as well as chemical factor that determines the quality of the water. Mercury present in the thermometer was measured the temperature of those water samples. Celsius was considered as unit for this measurement.

F. Turbidity

For turbidity analysis, well dried evaporating dishes were taken and weighed accurately. The effluent sample was filtered through what man filter paper so that there was no turbidity i.e., filtrate was made as clean as possible. The clear filtrate in the evaporating dish was allowed to evaporate on a water bath.

The dish was then placed in an oven for one hour and heated at 105 degree Celsius to ensure complete drying. That was then cooled in a desiccators and weight finally.

G. For Conductivity

Reagents were prepared for testing the given water samples. Then the conductivity meter is required to be calibrated. The conductivity was measured according to the standard protocol [9,10].

IV. RESULT AND DISCUSSION

From the above experimental analysis, following results were obtained from the analysis of physico-chemical parameters of water.

Table-1 Physico-chemical parameters of water from seven different ponds

Sample	pH	Conductivity	TDS (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	DO	Temperature (°C)	BOD(mg/l)
S1	7.22	0.231	534	130	80	10.81	21.3	1.21
S2	7.04	0.264	547	100	50	8.13	21	0.81
S3	7.01	125	89	150	50	5.76	20	0.4
S4	8	0.367	157	150	128	8.9	22	1.21
S5	7.21	1.728	300	100	150	7.3	21	0.81
S6	7.11	198.6	89	120	80	11.62	22	0.81
S7	6.17	0.904	576	170	60	4.3	20.8	0.41

The degree of heat is measured in the form of temperature. Temperature affects the oxygen content of water as well as the metabolic activities of aquatic organisms [11]. During this study temperature was ranged from 20 to 22 degree Celsius in different water samples. Maximum temperature was observed in Nata pokhari, whereas minimum was observed in karadia pokhari.

The pH of a solution refers as the logarithm of the reciprocal of the hydrogen ion activity at a given temperature. pH is defined as the intensity of the acidic or basic character of a solution at a given temperature. In this study highest pH value 8 was found in Pradip sagar while lowest 6.17 in khajurisagar. Rest of them are slight alkaline pH. A neutral to slightly alkaline pH range is most favorable to fish ponds[12].

The electric current carries in an aqueous solution is measured by electrical conductivity. It is an useful technique to measure the purity of water samples as well as the presence of ions in that samples. In this study area, the conductivity ranged from 0.231-198.6 $\mu\text{mhos cm}^{-1}$.

Total dissolved solids (TDS) denote the presence of mainly the different kind of organic or inorganic materials present in water. In present study the TDS ranged from 89-576 mg/l. The pond water samples which having low TDS that indicates the water is less mineralized and comparatively with lesser pollutants[13].

Hardness determines the presence of earth metals like calcium and magnesium in water samples. These elements help in biosynthesis of bone and scale in metabolic pathways in different fishes. The ideal value of hardness for fish culture is at least 20 ppm and a range of 30-180 mg/l. In present study the total hardness of pond water ranges between 100 mg/l to 170 mg/L and the lowest value was found in Rajabandh i.e. 100 mg/l.

Alkalinity is the buffering capacity of water. It is the ability to resist changes in pH and is measure of total concentration of bases in pond water. The water with total alkalinities of 20-150 mg/l is suitable for fish culture. In this study, the alkalinity varies from 50-180 mg/l. DO is one of the most important parameters of water quality analysis. It is also reported that the variation in DO was caused due to the eutrophication and metabolic activities of organisms. BOD determination is used for assessing the organic pollution[14]. BOD is the measure of dissolved oxygen consumed by microorganism during the oxidation of reduced substances in water. It is a good exponent of pollution and therefore helps in check the suitability of water for consumption. The BOD level in the present study ranges between 0.40 mg/l to 1.21 mg/l. In the present study dissolved oxygen ranged from 4.3mg/l -11.62mg/l. In this study, it is found that DO value was higher in ponds which may be due to the low temperature.

V. CONCLUSION

The present study on assessment of water quality of pond water of Karanjia town indicated that there is constant deterioration of water quality. It was due to the maximum consumption of pond water by the local people for their daily activities including dumping of household into the pond. They also washing their dishes, clothes and discharging the detergents in the pond. It may not be advised for it at all safe for drinking purpose. Therefore the pond water is unfit for aquatic life. So that steps must be taken by government bodies to clean the water and local people must cooperate to the government to clean the pond water. As this study was undertaken during the winter, So seasonal variation can be studied related to this parameters for improving the water quality and also help in monitoring the quality of pond.

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