Original Research Paper | Environmental Science | Volume : 6 ¦ Issue : 9 ¦ Sep 2021 ¦ e-ISSN : 2456-5040

ASSESSMENT OF PHYSICOCHEMICAL PARAMETERS OF RAMPUR POND KUMHARI, CHHATTISGARH

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ABSTRACT

Rampur Pond in Durg District, 21°15'35"N 81°30'06" E, is being studied using an of physicochemical parameters The pH, Total Dissolved Solids (TDS), Hardness, Biochemical Oxygen Demands (BOD5), Chemical Oxygen Demands (COD), Turbidity, and Alkalinity of river water were all examined. The physicochemical analysis was extensively carried out on each sample using known standard methods. The results of this analysis point out the fact that all the parameters are within the permissible limits prescribed by WHO, ICMR, and BIS drinking water standards which indicate that the water quality of Kolura pond is good and can be used for domestic, irrigation, and drinking purposes.

KEYWORDS: River water, pollution assessment, physicochemical parameters, pH, TDS.

1. INTRODUCTION:

Water is a vital component of life. The survival of every living organism in the world depends on water. Water is used for a variety of other purposes in addition to its physical necessity. In addition, as the population grows, so does the need for water. From a business perspective, water is also essential, but polluted water has negative effects on living organisms. As a result of high treatment costs and other factors, most industrial effluents are not treated before being discharged into waterways [1]. Because of its high impurity, it contains various types of harmful contaminants. Manufacturing effluent excretion Because of its high impurity, it contains various types of harmful contaminants [2]. Chhattisgarh's manufacturing effluents are generally dumped into rivers or canals. As a result, the water environment around us is becoming more and more polluted, and we have no way of controlling it. Although 70% of the world's surface is covered by water, the gap between supply and demand is widening and reaching an unacceptable level of imbalance. As far as the environment is concerned, the disposal of municipal and industrial wastes in the water sources is causing major problems for the environment [3]. Global efforts are made to recycle and reuse it effectively and efficiently [4].In developed countries, such as Chhattisgarh, there are strict regulations for the removal of industrial pollutants. As a result, the majority of rivers in industrial areas serve as dumping grounds for industrial wastes. African and Asian countries are experiencing rapid industrial growth, which makes it difficult to keep the environment clean [5]. Anthropogenic persuasion has made river water pretentious in quality. River water is contaminated with a variety of diseases-causing contaminants that come from domestic, industrialized, agricultural, and related sectors [6]. There is a wide range of contaminants in industrial wastewater because it is dependent on the production of the industry [7]. In river water, a wide range of substances can be found. They may be flushed waters, which may contain acids, metals, and toxic chemicals [8]. Contaminated effluents can have a negative impact on human health, leading to chronic and debilitating diseases [9-10]. Ecosystem wastewater, which may contain organic matter and plant nutrients, flows through a variety of water sources. They can accumulate in plant tissues at levels that are higher than the standard levels, which could be harmful to life in a complete cycle [11]. The people in this part of the world rely on groundwater and surface water for their livelihood. Water pollution is attributed to industrial and municipal waste. Toxic microorganisms contaminate drinking water and water used for household and irrigation purposes due to the presence of heavy metals in the water [12-13]. Because of this, various parameters of the water used for this purpose should be tested at a regular interval. Determining how wastewater and heavy metal contamination affects ecosystems was the goal of this study. A more thorough investigation is needed to determine the extent to which the environment in this study area has been contaminated, so that appropriate measures can be taken to prevent water contamination by toxic chemicals.

2. MATERIAL AND METHODOLOGY:

2.1 Study area:

Kumhari is a municipal council in Chhattisgarh's Durg district. It is one of the three municipal councils in the Durg district of Chhattisgarh. From Durg district headquarters, it is 27 KM to the east, while from Raipur, it is 13 KM to the west Figure 1 shows the study area. Locality: Kumhari, Rampur, Durg, 21°15'35"N and 81°30'06"E.

Figure 1: Study area Rampur, Kumhari, Durg

2.2 Sample Collection:

Water samples were collected from the Rampur pond, located in Kumhari, district. The sample was collected in pre-cleaned and sterilized polyethylene bottles and collected with column water samples from at least five spots in each experimental pond between 8.00 to 9.00 am at a depth of 30 cm below the water surface. The samples were mixed in a plastic container and brought into Laboratory and were stored at 40C for further analysis.

2.3 Physicochemical characteristics:
Inorganic compounds and Organic compounds are the main in-charge character for the pollution of water. They determine the measure of hardness, dissolved oxygen, biological oxygen demand, chemical oxygen demand, alkalinity, etc. It is also caused by various microbial activities of microorganisms. The parameters such as pH, TDS, hardness, BOD, alkalinity, turbidity, DO and COD know about the status of pollution in river water were analyzed by standard method [14].

2.3.1 pH:
pH is considered to be the most important river water parameter. River water pH is less than 6 corrosive and if the pH is more than 9 they cause metal determination as some metal ions precipitate as carbonates or hydroxides. In this study, pH was determined by a digital pH meter (model BT-600) [15].

2.3.2 Total dissolved solids:
The suspended and dissolved solids in river water are considered total solids. Solids that can settle can be removed by sedimentation. Usually, about 60% of the suspended solids in manufacturing river water have solids that can settle. This test was done by measuring the volume of solids in one liter of a sample that will settle on the bottom of a conical flask during the subsequent evaporation and drying in an oven at a specific temperature of 103- 105°C [16].

2.3.3 Hardness:
Hardness is produced in river water due to various reasons by multivalent metallic cations. Total hardness in water is defined as the summary absorption of calcium and magnesium cations expressed in milligram equivalents per kilogram or microgram equivalents per kilogram. Hardness is determined by the EDTA method by alkaline condition. When EDTA was added as a titrating, Ca and Mg divalent ions formed complexes resulting in a sharp change from wine red to blue which indicates the endpoint of the titration [17].

2.3.4 Biological oxygen demand (BOD):
BOD5 test is a valuable test in the analysis of sewage, industrial effluents, and grossly polluted water. It is considered as the major characteristic used in stream pollution control. It is generally the amount of dissolved oxygen required for the biochemical decomposition of organic compounds and the oxidation of certain inorganic materials under controlled conditions of temperature and incubation period which was done for five days incubated at 27°C in a BOD5 incubator (APAO, 1995).

$$BOD5 = (D0 - D5) / 5$$

Where Do is the dissolved oxygen (DO) of the diluted solution after preparation (mg/l). D5 is the DO of the diluted solution after 5-day incubation (mg/l); P is the decimal dilution factor [18].

2.3.5 Chemical oxygen demand (COD):
The chemical oxygen demand test is useful in studying performance evaluation of river water treatment plants and monitoring relatively polluted water bodies. It is used as a measure of the oxygen requirement of a sample that is susceptible to oxidation by a strong chemical oxidant. Chemical oxygen demand was done with the closed reflux method in which results were obtained in 3-4 hours. The test is useful in studying the performance evaluation of wastewater treatment plants and monitoring relatively polluted water bodies. We took 15 ml COD digestion tubes (pre-washed with dilute H2SO4) and added the following in sequence as transferred 0.50 ml wastewater sample (Inlet) or 1.00 ml treated sample. Then 2.5 ml standard potassium dichromate digestion reagent was added slowly and mixed. Further, 3.5 ml sulphuric acid reagent was added through the side of the tubes and allowed to settle at the bottom. The contents were capped and mixed (wear gloves as the contents are very hot) and cooled. Again, transfer tubes in the pre-heated COD digested at 150°C in 2 h. 3 blanks were applied by substituting DW for the sample and the process continued exactly like the sample. In a titration, the contents of the COD digestion tube in a 100 ml beaker were transferred. Thereafter, distilled water was added to make the volume 50 ml. Finally, 1-2 drops of Ferroin indicator were added and titrated against 0.05 M ferrous ammonium sulfate (FAS) solution [19].

$$\text{COD as mg } O_2/L = (A-B) \times M \times 8000/\text{sample in ml}$$

Where,

A = ml FAS used for blank;

B= ml FAS used for sample

M= morality of FAS.

2.3.6 Alkalinity:
Alkalinity is not a chemical in water, but, rather, it is a property of water that is dependent on the presence of certain chemicals in the water, such as bicarbonates, carbonates, and hydroxides. A definition of alkalinity would then be "the buffering capacity of a water body; a measure of the ability of the water body to neutralize acids and bases and thus maintain a fairly stable pH level". In more simple terms, water with a high alkalinity will experience less of a change in its own acidity, for instance, when acidic water, such as acid rain or a acid spill, is introduced into the water body [20].

2.3.7 Turbidity:
Turbidity is the measure of relative clarity of a liquid. It is an optical characteristic of water and is a measurement of the amount of light that is scattered by material in the water when a light is shined through the water sample. The higher the intensity of scattered light, the higher the turbidity. Material that causes water to be turbid include clay, silt, very tiny inorganic and organic matter, algae, dissolved colored organic compounds, and plankton and other microscopic organisms [21].

2.3.8 Dissolve Oxygen (DO):
Although water molecules contain an oxygen atom, this oxygen is not what is needed by aquatic organisms living in natural waters. A small amount of oxygen, up to about ten molecules of oxygen per million of water, is actually dissolved in water. Oxygen enters a stream mainly from the atmosphere and, in areas where groundwater discharge into streams is a large portion of streamflow, from groundwater discharge. This dissolved oxygen is breathed by fish and zooplankton and is needed by them to survive [22].

3. RESULT AND DISCUSSION:
Results obtained during the analysis were shown in the Table-1 and compared with values of WHO, ICMR, and BIS drinking water standards.

Table 1: Physico-Chemical Parameter of Rampur Pond and compared with values of WHO, ICMR, and BIS

S.N.	Parameter	WHO	ICMR	BIS	Obtained value
1.	pH	6.5-9.2	7-8.5	6.5-8.5	7.5
2.	TDS(mg/l)	500	500	500	235
3.	Hardness (mg/l)	600	600	600	220
4.	Alkalinity (mg/l)	600	600	600	165
5.	DO (mg/l)	4-6	4-6	4-6	5.48
6.	BOD (mg/l)	06	----	----	5.14
7.	COD (mg/l)	10	----	----	9.2
8.	Turbidity (NTU)	10	10	10	3.00

The water samples were clear, colorless, and odorless. pH is the term used universally to express the intensity of acid or alkaline conditions of the water. It plays important role in the growth of flora and fauna and also indicates whether the water is safe or not for drinking and irrigation purposes. The pH of the pond water was ranged from 7.5 which is slightly alkaline due to the presence of carbonates and bicarbonates. Most of the turbidity is due to colloidal and extremely fine dispersions. The turbidity of pond water was 3.00 NTU. TDS indicates the salinity behavior of water and describes all solids (mineral salts) that are dissolved in water. The value of TDS was found at 235 mg/liter. Water containing more than 500 mg/l of TDS is not considered desirable for drinking water supplies11.

Dissolved oxygen is a very important parameter in water quality assessment, low dissolved oxygen gives a bad odor to water due to the anaerobic decomposition of organic waste. But in the present study, dissolved oxygen values of water samples were 5.48 mg/l which were within permissible limit by WHO, ICMR, and BIS. BOD and COD values were 5.14 and 9.2 mg/l respectively which are within permissible limit12. Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of water. It is due to the salts of Ca^{2+} and Mg^{2+}.In the present study Total hardness was found in the range 220 mg/liter. The Alkalinity of water is its capacity to neutralize a strong acid and it is normally due to the presence of carbonates, bicarbonates, and hydroxides compounds of Ca^{2+}, Mg^{2+}, and Na^{+}. Total Alkalinity values for all the investigated samples were found 165 mg/l.

4. CONCLUSION:
In the present study the values of water quality parameters such as pH, turbidity, TDS, Hardness, Alkalinity, DO, BOD, and COD of collected samples from Rampur Pond in Durg District were found to be within the recommended limits of WHO, ICMR, and BIS. Therefore, the quality of water is good in residential areas of the Durg District. However, it is also important to investigate other potential water contaminations such as heavy metals and radiological materials for a longer period, including human body fluids, to assess the overall water quality of Durg District.

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