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International Multidisciplinary E-Conference On Contribution of Various Aspects In Nation Building

Date : 11th to 13 th October 2021

Organised by

Department of [English, Marathi, Sociology, History, Commerce, Home Economics, Chemistry, Botany and Mathematics]
Shetkari Shikshan Sanstha's
Arts, Commerce & Science College, Maregaon Dist. Yavatmal, Maharastra, India

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Water Quality Assessment of Chikhaldara Lakes

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ABSTRACT

Water plays an important role in natural ecosystem as it is the basic need of all the living organisms. Human development is directly related to water resources as it is used for drinking, agricultural, industrial and other purposes. The quality of water is usually expressed on the basis of physical, chemical and biological parameters. Increased human population, industrialization and man-made activities are some factors which cause contamination of water. Good quality water is essential for the improvement of life. It is therefore necessary to check the physico-chemical parameters of water that is being used. In the present study, the physico-chemical parameters such as temperature, pH, electrical conductivity (EC), total dissolved solids (TDS), dissolved oxygen (DO), chemical oxygen demand (COD), biological oxygen demand (BOD), free carbon dioxide, chlorides, calcium and magnesium of water from lakes of Chikhaldara, a well known hill station of Vidarbha region have been determined.

Keywords : Internet of Things (IoT), Artificial Intelligence (AI), Wi-Fi module and NODE MCU.

I. INTRODUCTION

Melghat is located in the Satpuda hill ranges of Forsythls and Dunbar's Central India with forests having unique ecosystems with enriched bio-diversity and a variety of habitats. The area of Melghat comprises mainly two tehsils of Amravati district of Vidarbha region namely Chikhaldara and Dharni, bordering Madhya Pradesh in north and east. Its latitude lies between 21.15°N to 21.45°N and longitude between 76.57°E to 77.33°E. Chikhaldara is a popular hill station and a municipal council. This place is visited by a considerable number of tourists every year. The water requirement of Chikhaldara town is fulfilled by the nearby lakes. Sewage or anthropogenic activities can lead to water pollution. A scientific study is necessary to know the

physico-chemical parameters of water in these lakes to compare with the standards as mentioned by WHO, BIS, etc. [1].

SITE SELECTION:

Shakkar lake and Kalapani lake contributing the water supply of Chikhaldra were selected for investigation. The samples were collected and studied for the physico-chemical parameters in the rainy season. A sample was collected from 50 cm below the surface at each location with a polyethylene bottle and brought to the laboratory.

MATERIALS AND METHODS:

Temperature was measured by a Celsius thermometer; pH was recorded by a pH meter and electrical Conductance was measured by a conductivity meter. Total dissolved solids were measured by evaporation method. Dissolved oxygen was determined by Winkler's Iodometric method. Free CO_2 was measured by titration method. Chloride was estimated by Argentometric method. Chemical oxygen demand (COD) was measured by potassium dichromate titration method, biochemical oxygen demand (BOD) of water was determined by titration of sodium thiosulphate. Calcium and magnesium were measured by EDTA method.

RESULTS AND DISCUSSION:

Table 1 shows the values obtained for various physico-chemical parameters of water.

S.No.	Parameters	Shakkar Lake	Kalapani. Lake
1	Temperature (°C)	25.4	25.1
2	pH	7.48	7.52
3	EC (µmhos)	116.7	121.4
4	TDS (mg/l)	82.1	79.3
5	DO (mg/l)	5.24	5.86
6	Free CO_2 (mg/l)	2.51	2.26
7	Chloride (mg/l)	7.7	6.9
8	COD (mg/l)	9.1	8.4
9	BOD (mg/l)	3.7	3.3
10	Calcium (mg/l)	19.2	18.4
11	Magnesium (mg/l)	7.1	6.7

Table 1- Physico-chemical parameters of water

Temperature:

The temperature of water may not be of much importance in case of pure water but in polluted water it can have effects on dissolved oxygen and biological oxygen demand. The temperature of water observed as 25.4 and 25.1°C for Shakkar and Kalapani lakes respectively.

pH:

pH of water is the measure of hydrogen ion concentration in it and thus indicates acidity or alkalinity. The pH of drinking water lies within the range 6.5–8.5 [2]. The pH value observed 7.48 and 7.52 respectively for Shakkar and Kalapani lakes.

Electrical conductivity (EC):

Electrical conductivity is the capacity of electrical current that passes through the water and indicates the presence of ions within it. It is also related to total dissolved solids [3].The desirable limit of conductivity according to BIS and ICMR is 600 µm/cm. The electrical conductance values for Shakkar and Kalapani lakes found to be as 116.7 and 121.4 µmhos respectively.

Total dissolved solids (TDS):

Total dissolved solids in ground water consist of inorganic salts and small amount of organic matter. These salts are chemical compounds comprised of anions such as carbonates, chlorides, sulphates, and nitrates and cations such as potassium, calcium, magnesium and sodium. TDS value beyond permissible limit (500 mg/l) may cause gastro intestinal irritation. Normally ground water has a higher TDS as compared to surface water [4]. TDS values for Shakkar and Kalapani lakes observed as 82.1 and 79.3 mg/l respectively.

Dissolved oxygen (DO):

Dissolved oxygen is directly related to photosynthesis, bacterial activity, availability of nutrients within the water body [5]. It also affects survival, growth and reproduction of aquatic animals. The dissolved oxygen values for Shakkar and Kalapani lakes obtained as 5.24 and 5.86 mg/l respectively.

Free Carbon dioxide (CO_2):

The end product of organic carbon degradation in almost all aquatic environments is carbon dioxide whose value indicates the measure of net ecosystem metabolism [6]. In present investigation, free CO_2 values obtained as 2.51 and 2.26 mg/l respectively for Shakkar and Kalapani lakes.

Chlorides:

It occurs in almost all types of natural water. Increased values of chlorides are indicators of the organic pollution due to organic wastes of animals and also industrial origin. Aquatic life in a water body can be harmed due to higher level of chlorides [7]. For Shakkar and Kalapani lake water samples chloride levels were recorded as 7.7 and 6.9 mg/l respectively.

Chemical oxygen demand (COD):

The measure of organic matter contamination in water can be expressed in terms of COD and is specified in mg/l.COD is the amount of dissolved oxygen that is required to cause chemical oxidation of organic matter present in water. Usually COD is used in conjunction with BOD. Jingxi Ma et al. assessed COD as water quality parameter of waste water [8]. COD values found to be 9.1 and 8.4 mg/l for Shakkar and Kalapani lakes respectively.

Biological oxygen demand (BOD):

Biological oxygen demand is the measure of the oxygen in the water that is required by the aerobic organisms. Biodegradation of organic material causes oxygen tension in water and increases BOD [9]. BOD values for Shakkar and Kalapani lakes assessed to be 3.7 and 3.4 mg/l respectively.

Calcium (Ca):

Calcium is present in all types of natural water in high quantities. Rock leaching, disposal of sewage and industrial wastes are the important sources of calcium. Ranpat et al. assessed the impact of calcium and magnesium in ground and drinking water on human health [10]. Calcium concentration in water for Shakkar and Kalapani lakes observed as 19.2 and 18.4 mg/l respectively.

Magnesium (Mg):

Like calcium, magnesium also occurs in all kinds of natural waters but its concentration remains generally lower than calcium. The main source of magnesium is rocks. Sewage and industrial wastes are also its important sources. In the present study, the magnesium values for Shakkar and Kalapani lakes observed as 7.1 and 6.7 mg/l respectively.

CONCLUSION:

On the basis of results obtained for various physico-chemical parameters of water samples collected from Shakkar and Kalapani lakes of Chikhaldara, it may be concluded that no remarkable variation in temperature was observed. However, the variation is mainly related with the temperature of atmospheric and weather condition. The pH of both the lakes water observed within the permissible limit and in the alkaline side. Electrical conductivity value is higher for Kalapani lake as compared to the Shakkar lake. For both the lakes, total dissolved solid values found in the permissible range (82.1 and 79.3 mg/l). For tested water samples, dissolved oxygen values found are favorable for aquatic life. For both the lakes, lower values recorded for free carbon dioxide (2.51 and 2.26 mg/l) showing suitable condition for aquatic life. The result obtained for chlorides registered the values 7.7 and 6.9 mg/l which is indication of contamination of organic wastes but within the desirable limit. Higher chemical and biological oxygen demand values were recorded for Shakkar lake water than Kalapani lakes. The calcium and magnesium concentration for both the lakes was within the acceptable limit with respect to BIS.

Thus the above discussion indicates that there is not much difference in the water quality parameter values of both the lakes. Also these values indicate the contamination of water may be due to sewage or anthropogenic activities but within the permissible limits.

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