



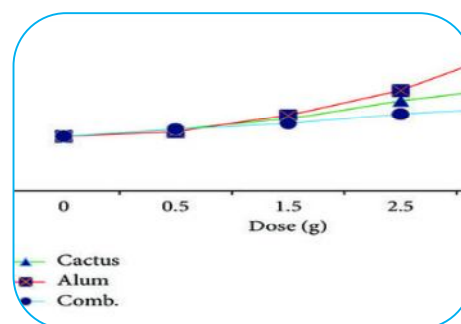
ASSESSMENT OF PHYSICO-CHEMICAL PARAMETERS OF GAURALA LAKE OF BHADRAWATI, DIST. CHANDRAPUR, MAHARASHTRA, INDIA

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ABSTRACT

The present paper deals with the physico-chemical properties of Gaurala Lake of Bhadrawati of Chandrapur district, Maharashtra in 2018 – 2019. Gaurala Lake is located near Gaurala area of Bhadrawati on the way to railway station road and adjacent to Ganpati temple (Vinayaka) within latitude 79.110474N and longitude 20.033844 E. Water is an essential component for living beings and plays an important role in sustaining the natural ecosystem of the world. In the present study, an attempt has been made on physico-chemical analysis of Gaurala Lake. This paper is intended to be a study of concerning lake water and some physico-chemical parameters such as temperature, pH, transparency, turbidity, conductivity, TS, TDS, TSS, DO, BOD, COD, alkalinity, total hardness, calcium, magnesium, chloride, and sulphate. The quantity parameters were compared with the standards laid down by APHA.



KEYWORDS - Gaurala Lake, physico-chemical parameters, Bhadrawati, Maharashtra.

INTRODUCTION

The lake provides sufficient water for drinking as well as other useful purposes to mankind. Water is one of the essential requirements for sustaining the life activities of all ecosystems. Fresh water is essential for drinking domestic use, fisheries, agricultural and industrial uses. This kind of use can lead to deterioration in water quality and quantity that impact not only the aquatic ecosystem but also the availability to water for human needs. All life on earth depends on good quality of water. The environmental pollution ultimately contaminates water of rivers, ponds, lakes and dams. The assessment of water quality is an important aspect for the developmental activities of that region, because the lakes, reservoirs and rivers are used for supplying water for domestic and other commercial activities. The physico-chemical and biological analysis is needed to obtain a perfect picture of the prevailing water quality at any situation in any region of the subcontinent. A systematic attempt has been made to study the spatial and temporal variations of its hydro-chemical conditions with a view to evaluate the current status of water of the lake and delineate the source and extent of pollution. The lentic water bodies (Gaurala lake) selected for the present investigation is located at the Bhadrawati, near Ganpati temple (Vinayaka), railway station road.

MATERIAL AND METHODS

Water samples from Gaurala lake, Bhadrawati were collected from five sampling sites (G1, G2, G3, G4, G5) in the morning hours (9.30 – 10.30 am) during the period December 2018- February 2019 in containers and immediately transferred to laboratory for analysis. Parameters like temperature, humidity, transparency, were recorded at lake site whereas the parameters like pH dissolved oxygen alkalinity, hardness, chlorides, total phosphates, nitrate, sulphates and other parameters were measured/studied and they are tabulated in table 1, table 2, table 3, table 4, and parameters like alkalinity, hardness, chlorides, total phosphate nitrates, sulphates and other parameter were measured as per the guidelines given by APHA, 1989.

RESULT AND DISCUSSION:

In this investigation, results, so obtained were described in following paragraphs and are discussed with previous work of various workers.

During the study, pH of Gaurala lake was ranged from 5.64 – 6.10. Similar findings were recorded by Sadhwani (2010) while studying limnological parameters of Shaha lake, Karanja (Lad), District Washim (M.S.), Pearsall (1930) and Zafar (1996) observed that the pH of water appear to be dependent upon the relative quantities of calcium carbonates and bicarbonates being alkaline when the quantities of carbonates is high.

Dissolved oxygen is an important parameter which affects chemical as well as biological reactions in an ecosystem. Dissolved oxygen content indicates the health and ability of water body to purify itself through biochemical processes. Oxygen is also needed for many chemical reactions that are important to lake functioning such as oxidation of metals, decomposition of dead and decaying matters etc. Dissolved oxygen (DO) values were studied by Yeole and Patil (2005) while studying nutrient dependent hydro-biological status of Yedshi lake, District Washim (M.S.).

Physico-chemical Parameters

Physical parameters: Physical parameters were studied

Atmospheric temperature was 25°C (December 2018), 27°C (January 2019) and 33°C (February 2019) and water temperature was 22°C (December 2018), 24°C (January 2019), 30°C (February 2019). The pH was in between 5.64 – 6.10 (table 2,3,4), colour, odour, tastes, turbidity, transparency, conductivity, total solids, total dissolved solids and total suspended solids, the values are depicted in table – 2,3 & 4.

Chemical Parameters: Chemical Parameters were studied

Chemical Parameters were also analyzed for the water quality. Dissolved oxygen (DO), Bio-chemical oxygen demand (BOD), Chemical Oxygen demand (COD), alkalinity, calcium, total hardness, magnesium, chloride, sulphate. The values were depicted in table – 2,3 & 4.

Total alkalinity is the measure of the capacity of water to neutralize a strong acid. It is generally imparted by the salts of carbonates, bicarbonates, phosphates, nitrates, borates, silicates etc. together with the hydroxyl ions in free state. Salvi (1986) and Dash (1993) studied the fluctuation in alkalinity might be due to the entry of alkaline particle through surface runoff and low production of plankton population.

Total solid refer to matter suspended and dissolved in water. Water with high total solids generally are of inferior palatability and may induce an unfavorable physiological reaction (APHA, 1989)

Total hardness of the water is the measure of the capacity of water to react with soap. Calcium and magnesium are the principal cation that imparts hardness. The total hardness of water therefore reflects as the sum total of alkaline metal cations present in it (Ramchandra et.al.,2006). Chloride anion is generally present in natural waters. High chloride content has damaging effect on agricultural crops (Ramachandra et.al. 2006)

Sources of sulphates are mainly sulphates rocks such as gypsum and sulphur minerals such as pyrites and also due to air and water pollution. Sulphates contribute to the total solids content and in a reduced and anaerobic condition produced hydrogen sulphide which gives rotten egg odour to the water (Ramchandra et. al. 2006), Angadi et. al. (2005) studied sulphates and found maximum in summer and minimum in mansoon season from Papnash pond, Bidar, Karnataka.

Phosphorus is one of the major macronutrients responsible for biological productivity (APHA, 1989). The nitrate is one of the most oxidized forms of nitrogen and is an essential plant nutrient. Nitrate concentration is associated with rain water runoff and sludge discharge (Jha and Barat, 2003). Summer peak of nitrates may be due to its negative proportionality to dissolved oxygen (Jakher and Rawat, 2003)

Tripathi et.al. (2014) studied physico-chemical parameters of River Ganga at Holy place Shrinngverpur, Allahabad and found that in three seasons there were different seasonal fluctuations in various physico-chemical parameters. Belkhode et. al. (2015) noted significant variation in chemical parameters at different sites of Kuhu lake. They observed that the quality of water was not acceptable for drinking purpose and domestic life use.

Harney et. al. (2016) studied the seasonal variation in the physico-chemical parameters of Malhara pond of central India which exhibit cyclical variations. The slight high value of conductivity, total alkalinity, chloride phosphate and nitrate in Malhara pond indicate towards its slight polluted nature and it exhibits slightly polluted status. Luharia et.al. (2016) studied the seasonal variation of physico-chemical parameters of Gaurala and Vinjasa Lake of Bhadravati and showed that there were many variations in the lake. The higher value of carbon-dioxide, total alkalinity, phosphate, sulphate and nitrate in Gaurala Lake indicated its polluted nature. On the other hand, the lowest values of the above parameters in Vinjasa lake showed its non-polluted nature.

Chunne and Nasare (2017) studied the physico-chemical parameters of Nandgaon and Arwat Lakes of Chandrapur district with respect to seasonal variations and revealed that there was a significant seasonal variation in physico-chemical parameters and some of the parameters were in the normal range but pH and alkalinity of Nandgaon lake, COD and calcium level of both the lakes was slightly higher than standard value of ICMR, BIS & WHO. They concluded that Nandgaon lake has more organic pollution than Arwat lake. The reason behind it has more anthropogenic activities, continuous discharge of domestic sewage, agricultural runoff, washing clothes and cleaning cattle are more in Nandgaon lake. Chaudhary and Sitre (2020) observed that some variations in physico-chemical parameters of Naleshwar lake quality of water undergo through seasonal changes. Values were high during rainy season. Chaudhary and Sitre (2020) observed that all parameters in permissible range when the analysis of physico-chemical parameters in permissible range when the analysis of physico-chemical parameters of Lal Nala Dam was done. The concentration of parameters was lower than the maximum permissible limits of ISI and WHO standards when comparisons were made. Water temperature was lower than atmospheric temperature in summer, monsoon and winter season also. The pH values were slightly neutral and within a permissible limits in three seasons. Turbidity and transparency are in negative correlation such as turbidity maximum in monsoon and transparency minimum in monsoon. Total hardness and alkalinity are maximum in summer season, Dissolved oxygen in desirable limits of WHO so it shows good quality of water. BOD and COD are within limits, set by WHO, so pollution was not there.

CONCLUSION

The Gaurala Lake showed high content in terms of TDS, TSS, hardness calcium, magnesium, chloride, DO, BOD, COD etc. therefore we must take special care for lake water, and furthermore pollution should be avoided in and around lake water. The study generated a baseline regarding the quality of the water.

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Table 1:- Methods used for studying Physico-Chemical Parameter of Gaurala Lake		
SR.NO.	STUDIED PARAMETER	METHOD USED
PHYSICAL PARAMETERS		
1	Atmospheric Temperature (°C)	Thermometer
2	Water Temperature (°C)	Thermometer
3	Colour	Bright Sunlight
4	Odour	Varies from person to person
5	Tastes	Mouth produce flavor
6	Turbidity (NTU)	Nephelometer
7	Transparency (cm)	Secchi's Transparency
8	Conductivity (mhos/cm)	Electrical Conductivity Meter
9	T.S.(Mg/L)	Evaporate Sample
10	T.D.S. (Mg/L)	Evaporate Sample
11	T.S.S. (Mg/L)	
CHEMICAL PARAMETERS		
12	PH (Mg/L)	PH meter
13	DO (Mg/L)	Titrometer
14	BOD (Mg/L)	Titrometer
15	COD (Mg/L)	Titrometer
16	Alkalinity (Mg/L)	Phenolphthalein Alkalinity
17	Total Hardness (Mg/L)	EDTA Method
18	Calcium (Mg/L)	EDTA Method
19	Magnesium (Mg/L)	EDTA Method
20	Chloride (Mg/L)	Mohrs Method
21	Sulphate (Mg/L)	Spectrophotometric

Table 2:- Monthly variation of Physico-Chemical parameter of Gaurala Lake Bhadrawati, Site - G1, G2, G3, G4, G5 during						
DECEMBER 2018						
PHYSICAL PARAMETERS						
Sr.No.	Parameter	G1	G2	G3	G4	G5
1	Atmospheric Temperature	25	24	25	24	25
2	Water Temperature	22	21	22	22	21
3	Colour	350	320	280	260	250
4	Odour	1.92	1.69	1.50	1.78	1.55
5	Tastes	2	1.85	1.93	1.78	1.80
6	Turbidity	111.9	111.40	112	111.65	111.65
7	Transparency	24	23	25	24	27
8	Conductivity	341	248	475	550	249
9	T.S.	950	965	920	995	975
10	T.D.S.	960	966	936	990	980
11	T.S.S.	5.845	4.895	2.874	5.895	2.505
CHEMICAL PARAMETERS						
Sr.No.	Parameter	G1	G2	G3	G4	G5
12	pH	5.85	5.95	5.64	6.10	6
13	DO	3.5	3.6	2.9	3.1	3.3
14	BOD	3.895	5.101	4.848	3.945	4.985
15	COD	14.4	12.2	13.9	12.8	13.7
16	Alkalinity	500	495	540	505	545

17	Total Hardness	215	220	195	208	200
18	Calcium	218.4	210	200	195.5	215.1
19	Magnesium	13.10	11.65	12.40	11.50	13.26
20	Chloride	102.1	100.5	120.5	99.3	113.8
21	Sulphate	12.20	11.24	11.12	12.02	11.15

Table 3:- Monthly variation of Physico-Chemical parameter of Gaurala Lake Bhadrawati, Site - G1, G2, G3, G4, G5 during Jan - 2019

JANUARY - 2019						
PHYSICAL PARAMETERS						
Sr.No.	Parameter	G1	G2	G3	G4	G5
1	Atmospheric Temperature	27	26	26	27	27
2	Water Temperature	24	24	23	24	23
3	Colour	345	300	250	240	170
4	Odour	1.88	1.7	1.7	1.75	1.45
5	Tastes	1.90	1.76	1.95	1.76	1.80
6	Turbidity	111.75	111.7	112.45	112	111.50
7	Transparency	25	22	24	25	26
8	Conductivity	348	250	485	560	255
9	T.S.	952	967	925	997	980
10	T.D.S.	962	968	940	995	981
11	T.S.S.	5.855	4.897	2.870	5.895	2.610
CHEMICAL PARAMETERS						
Sr.No.	Parameter	G1	G2	G3	G4	G5
12	pH	5.94	5.89	5.70	6.02	5.99
13	DO	3.5	3.3	3.1	2.9	3.5
14	BOD	4.113	5.11	5.150	4.451	5.105
15	COD	14.1	12.5	14	12.5	13.4
16	Alkalinity	555	515	535	525	550
17	Total Hardness	220	225	200	212	210
18	Calcium	218.1	205	190.4	195	214.6
19	Magnesium	13.05	11.50	12.30	11.35	13.16
20	Chloride	102	100	120.3	99.1	113.5
21	Sulphate	12	11.15	11.5	11.9	11.3

Table 4:- Monthly variation of Physico-Chemical parameter of Gaurala Lake Bhadrawati, Site - G1, G2, G3, G4, G5 during Feb - 2019

February - 2019						
PHYSICAL PARAMETERS						
Sr.No.	Parameter	G1	G2	G3	G4	G5
1	Atmospheric Temperature	33	32	33	32	33
2	Water Temperature	30	30	30	29	30
3	Colour	320	290	250	220	150
4	Odour	1.91	1.60	1.20	1.78	1.60
5	Tastes	1.9	1.68	1.97	1.78	1.75
6	Turbidity	112.2	111.6	112.15	111.75	111.80
7	Transparency	24	23	24	26	28
8	Conductivity	355	245	480	575	249
9	T.S.	950	966	923	998	982

10	T.D.S.	963	966	938	997	983
11	T.S.S.	5.875	4.80	2.865	5.900	2.550
CHEMICAL PARAMETERS						
Sr.No.	Parameter	G1	G2	G3	G4	G5
12	pH	5.90	5.72	5.65	6.08	5.84
13	DO	3.7	3.5	2.9	3.2	3.4
14	BOD	3.948	4.98	4.98	3.890	4.985
15	COD	14.5	12.2	12.9	112	13.5
16	Alkalinity	595	520	454	520	535
17	Total Hardness	222	230	202	216	208
18	Calcium	217.9	202.5	190.3	194.4	213.1
19	Magnesium	13.02	11.25	12.05	11.32	13.05
20	Chloride	111.09	99.09	120.0	99.1	113.1
21	Sulphate	11.09	11.08	11	11.02	11.01