Research Paper

Volume : 3 | Issue : 10 | October 2014 • ISSN No 2277 - 8179

Physico-Chemical and Acoustical Characterization of Lakes in and Around Coimbatore City

Chemistry

KEYWORDS : Water quality management, Pollution, Lakes, Free length ,Physico-chemical parameters.

R.Mahalakshmi	Department of Chemistry, Kumaraguru College of Technology, Coimbatore – 641049
P.S.Syed shabudeen	Department of Chemistry, Kumaraguru College of Technology, Coimbatore – 641049
K.Rathina	Department of physics, Kumaraguru College of Technology, Coimbatore – 641049

ABSTRACT

Global warming in aquatic ecosystem will lead to degassing of oxygen, increased stratification, reduced deep water circulation, changes in wind patterns, changes in species composition, eutrophication which leads to overall degradation of lake water ecosystem. In the process towards the creation of better opportunities and better comforts for living man does knowingly or unknowlingly the greatest damage to the ecosystem.The water quality in the form of physico chemical characteristics and Acoustical parameters were studied to assess the lake water suitability for various purposes. Sampling was done in five different lakes in and around Coimbatore city and subjected to water quality assessment .Results revealed that there was a lot of fluctuation in the physico chemical parameters of water samples. The implication on public health and aquatic organisms were also determined.

INTRODUCTION

Water quality plays an important role in the survival and distribution of aquatic organisms. It is dependent on physical, chemical,microbiological and aquatic organisms .A lake is a living entity and needs utmost care to derive maximum benefits. There is a need to discuss the issue in all dimensions and evolve a national plan for the protection of surface water resources.

Water is essential for the survival of any form of life .All biochemical reactions take place in the water medium .In addition water is required for various domestic purposes,irrigation,shipping ,sanitation , power generation and industries. With exploding population resulting in urbanization, industrialization and agriculture etc the demands for water supply have been increasing constantly.Man polluted much of the limited quality of water with sewage,industrial waste and wide array of synthetic chemicals. It was observed that the main sources of water contamination are urban pollution due to land fill municipal wastes, sewage of septic tank and drainage.

Surface water samples were collected from five sampling sites of the lakes for a period of 5 months in and around Coimbatore city. The sampling was carried out in the morning and the water samples were collected in plastic containers of 5 litre capacity. The collected samples from the investigated sites were subjected to physico chemical analysis to determine various water quality parameters.

MATERIALS AND METHOD:

Present study was carried out by collecting water samples from five different lakes from to the Coimbatore city for the period of five months from January 2010 to May 2010. These include Perur lake, Muthannan lake, Sengulam lake, Periakulam lake and Selvapuram lake and were denoted as L-1, L-2, L-3, L-4and L-5.Water samples were collected form the surface layers in the morning on the monthly basis in plastic containers of 5litre capacity and subjected to physico chemical analysis. The results of the parameters are presented in the form of the tables. The parameters include Hardness, Dissolved oxygen, pH, Conductivity ,Alkalinity, Biological oxygen demand , Sulphate, Nitrate, Sodium , Potssium , turbidity , Total dissolved solids. The viscosity measurement was also done using an Ostwalts viscometer. The density for the lake waters have been measured using specific gravity bottle of 10ml. Ultrasonic velocities for the lake waters have been measured using the ultrasonic liquid interferometer of frequency 2 MHz manufactured from Mittal enterprises at room temperature 303K with accuracy of ultrasonic velocity of ±.02%. Using the above mentioned equipments Ultrasonic velocity U, Density ρ, viscosity η for lake waters for various months are measured. From these measured data, the adiabatic compressibility (β), free length (L_f), were calculated using the relations as follows as being used in literature.

$$\beta = 1/ (U^2\rho)$$

$$L_f = K_T \beta^{½}$$

Where K_T is the temperature dependence constant.

RESULTS AND DISCUSSION

Hardness:

The observation made on the pH values of the lakes show that (table-1) the pH value of L-1 was alkaline in nature both in January and May month which shows excessive usage of detergents. There is no significant difference in the pH values of L-2,3 &4.Lake 5 shows alkalinity during the march month due to the reduction on the buffering capacity of water. The comparison made on all the five lakes (L 1-5) shows the alkaline nature may be due to 99% of carbon dioxide absorbed from air by water. It gets converted into bicarbonate and carbonate in the water showing alkalinity..The concentration of carbon dioxide in solution is proportional to the partial pressure of the gas above the solution (Henry law).

The conductivity values show no significant difference in the lakes 1 and 5 during all the five months. All the other lakes show the high conductivity due to the increased concentration of salts caused due to the evaporation during that season due to climatic change.

The hardness of the sample was recorded from January to May and there was no significant difference I the values in the lakes 1-5. (Figure1). Hardness does not contribute to pollution as it does not harm health in major way.

Alkalinity:

The alkalinity values were found to be very high in all the lakes except lake 4 during the month of May. The higher values due to the deposition of carbonate from the water on the plant surface.

Turbidity:

Lake 1 shows high turbidity during the month of January and March. Lake 2 shows both turbidity during March and May. Lake 3 shows low values in January and February. Lake 4 & 5 shows high value in the month of March. Turbidity appears to be minor aspect of Water pollution. It reduced the light penetration as well as the usage of water bodies. Turbidity varies in water bodies due to the terrain and various human activities.

BOD:

There is no significant difference in BOD values in lakes 1,2 and 4. But in lake 3 the values were found to be high in the month of February due to more micro organisms and oxygen demanding wastes. In the month of april the lake 5 shows low BOD due to diurnal fluctuations of dissolved oxygen.

TDS:

The large amount of total dissolved solids is mainly due to the industrial effluents which affects the quality of water and unsuitable for any purpose including irrigation. Stagnant water bodies usually have high TDS values and it was found to be so in lakes 1-5 , but there is no significant difference in the values.

Calcium & magnesium:

The calcium andmagnesium content in the water bodies was found to be high due to the sampling points of the lakes and more calcium in the form of bicarbonates.

Sulphate:

All the lakes show high sulphate concentration in the month of April and May due to organic matter waste containing sulphur which release bubbles of foul smeeling hydrogen sulphide.

Nitrate:

Nitrate are plant nutrients that cause plant life and algae to grow quickly. The nitrate content in lake bodies was found to high which may be due to the over fertilization , fish mortality and due to the decomposition of nitrogen from organic matter.

Sodium:

The concentration of sodium content in water bodies was found to be low in the month of March, April and May due to sewage pollution and there is no difference in the lakes 1 &3. the ratio of sodium to total cation is important for plant growth.

CONCLUSION :

In this investigation an detailed account of surface water parameters have been done in lakes 1-5. From the results, it is true that the lakes are polluted but in view of urbanization and industrialization , monitoring of the lakes for various pollutional parameters has been done to increase the awareness among the people so as not to form the lakes in to an open sewer. Moreover, the present investigation gives an advance warning of the increased pollution by various sources discharged in the lakes for necessary preventive measures in the near future

p H					
Month	Lake 1	Lake 2	Lake 3	Lake 4	Lake 5
January	8.110	7.630	9.000	8.440	8.260
February	8.460	8.250	9.110	8.520	9.060
March	8.570	8.020	8.960	8.410	7.800
April	8.500	8.280	9.240	8.530	7.610
May	8.180	7.880	9.060	7.820	7.960
Condutivity					
January	0.280	0.370	0.220	0.290	0.280
February	0.760	1.110	0.620	0.870	1.200
March	1.640	0.290	0.210	0.270	0.640
April	2.350	2.590	1.510	2.220	3.110
May	0.410	3.500	1.650	2.180	2.480
Sodium					
January	11.100	27.600	35.460	51.600	37.800
February	7.100	40.800	25.100	30.100	40.900
March	58.700	24.200	29.600	36.000	34.700
April	32.900	77.100	5.500	4.700	7.600
May	7.900	71.400	5.100	1.400	4.800
Potassium					
January	6.800	10.300	51.900	42.700	9.400
February	19.000	3.200	23.300	25.600	27.200
March	28.100	6.700	8.900	9.200	9.100
April	32.700	6.700	42.800	49.000	51.900
May	7.700	9.600	66.700	0.363	54.600
Hardness					
January	115.000	130.000	110.000	11.000	175.000
February	205.000	225.000	285.000	20.500	440.000
March	250.000	115.000	125.000	14.000	270.000
April	240.000	200.000	250.000	17.000	260.000
May	110.000	320.000	800.000	27.000	760.000
Alkalinity					
January	172.500	130.000	97.500	110.000	725.000
February	270.000	365.000	360.000	295.000	2,500.000
March	340.000	112.500	297.500	85.000	875.000
April	387.500	485.000	105.000	387.500	3,275.000
May	107.500	615.000	387.500	325.000	2,875.000
BOD					
January	1.915	1.780	1.570	0.940	1.470
February	1.368	2.100	1.890	1.150	1.050
March	1.270	4.000	0.630	0.420	0.420
April	1.880	1.570	1.570	2.000	1.050
May	2.900	2.730	1.280	0.420	2.100
COD					
January	72.000	60.000	0.000	28.000	4.000
February	44.000	12.000	72.000	12.000	36.000
March	24.000	40.000	72.000	8.000	24.000
April	64.000	8.000	72.000	4.000	24.000
May	424.000	20.000	68.000	16.000	32.000
TDS					
January	0.200	2.400	0.600	0.200	20.000
February	0.400	0.400	0.600	0.600	0.400
March	0.400	1.600	0.800	0.200	20.000
April	1.400	1.400	1.400	1.600	1.800
May	0.600	1.600	1.800	2.000	1.600
IRON					
January	363.300	0.000	0.000	0.000	23.630
February	318.180	0.000	0.000	0.000	0.000
March	454.540	0.000	0.000	0.000	0.000
April	427.270	0.000	0.000	0.000	44.540
May	463.630	0.000	0.000	0.000	42.720

	Ultrasonic	Density(kg/ m^3)	Viscosity Nsm^{-2}	Adiabatic compressibility	Free length	Acoustic impedance
	vu	ρ	η	β	Lf	Z
I	1500.00	999.80	9.07439E-04	4.445E-10	4.217E-11	1.522E+06
II	1521.80	996.00	9.01676E-04	4.335E-10	4.164E-11	1.516E+06
III	1530.20	993.00	9.14830E-04	4.301E-10	4.148E-11	1.519E+06
IV	1524.00	997.00	9.18240E-04	4.319E-10	4.156E-11	1.519E+06
V	1517.00	1000.80	9.21324E-04	4.342E-10	4.167E-11	1.518E+06
	February					
I	1520.00	999.19	9.48223E-04	4.332E-10	4.163E-11	1.522E+06
II	1519.00	999.29	9.48636E-04	4.337E-10	4.165E-11	1.518E+06
III	1528.00	998.04	9.71731E-04	4.291E-10	4.143E-11	1.525E+06
IV	1508.00	1000.73	9.61724E-04	4.394E-10	4.192E-11	1.509E+06
V	1555.00	998.44	9.97531E-04	4.142E-10	4.070E-11	1.553E+06
	March					
I	1521.10	996.85	8.87439E-04	4.336E-10	4.164E-11	1.522E+06
II	1518.00	997.92	9.11676E-04	4.349E-10	4.171E-11	1.515E+06
III	1534.00	996.33	9.34830E-04	4.265E-10	4.130E-11	1.528E+06
IV	1509.00	998.71	9.12405E-04	4.397E-10	4.194E-11	1.507E+06
V	1523.00	997.53	9.11324E-04	4.322E-10	4.158E-11	1.519E+06
	April					
I	1518.80	1000.00	8.87439E-04	4.335E-10	4.164E-11	1.522E+06
II	1517.20	1001.20	9.11676E-04	4.339E-10	4.166E-11	1.519E+06
III	1524.40	1001.50	9.34830E-04	4.297E-10	4.146E-11	1.527E+06
IV	1527.60	1002.90	9.12405E-04	4.273E-10	4.134E-11	1.532E+06
V	1536.80	1003.00	9.11324E-04	4.221E-10	4.109E-11	1.541E+06
	May					
I	1519.00	1001.00	9.88744E-04	4.330E-10	4.162E-11	1.522E+06
II	1534.80	999.00	8.91676E-04	4.249E-10	4.123E-11	1.533E+06
III	1529.50	999.90	9.44830E-04	4.275E-10	4.135E-11	1.529E+06
IV	1516.00	1000.20	9.18405E-04	4.350E-10	4.171E-11	1.516E+06
V	1544.20	998.53	9.19132E-04	4.200E-10	4.099E-11	1.542E+06

REFERENCE

1. Singh S.P., Pathak D. and Singh R. (2002). Hydrobiological studies of two ponds of satna (M.P.), India, Eco. Environ. Cons., 8(3), 289-292. | 2. Sala O.E., Chapin ii F.S., Armesto J.J., Berlow E., Bloomfield J., Dirzo R., Huber-Sanwald E., Huenneka L.F., Jackson R.B., Kinzig A., Leemans R., Lodge D.M., Mooney H.A., Oesterheld M., Poff N.L., Sykes M.T., Walker B.H., Walker M. and wall D.H. (2000), Global biodiversity scenarios for for the year 2100, science, 287, 1770-177 | 3. Sudhira H.S. and Kumar V.S.(2000), Monitoring of lake water quality in Mysore city. In: International symposium on Restoration of Lakes and wetlands: Proceedinga of Lake 2000 | 4. Adeymo O.K.(2003), consequence of pollution and degradation of Nigerial aquatic environment on fisheries resources, the Environmentalist, 23 (4), 297-306 | 5. Ravichandran S. and Ramanathan K., J. Pure Appl. Ultrason., 28 2006 | 6. Boyd CE, (1979), Water quality management in fish pond culture, Research and Development series No.22, International centre for Agriculture, Agricultural experimental stations .Auburn. |

Volume : 3 | Issue : 10 | October 2014 • ISSN No 2277 - 8179