



Analysis of Physic-Chemical Parameters for Pollution and Water Quality Status of Cherlapally Lake, Hyderabad, AP, India

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Abstract

Experiments were conducted to analyse the physico-chemical parameters in water samples from Cherlapally Lake, Cherlapally village, Ranga Reddy district, A.P. India. The lake was constructed in the year 1970's. The water flows all time of the year and the lake appears like full-tank. In the recent 15 years Cherlapally Lake receiving waste water (drainage) coming from Kapra Village and Kushaiguda areas in addition to heavy metal pollution from heavy metal and other industries. The main aim of this study is to assess the pollution status and quality of water of this lake. Water samples were collected from three sites of the lake that are in-let of the lake (site-1), out-let of the lake (site-2), middle of the lake (site-3), and analysed for various Physical-Chemical parameters. The outcome of the results is showed as: Temperature from 27.1^oC to 28.2^oC. pH ranged from 7.42 to 7.68, Electrical conductivity from 1419 to 1709 μ S/cm, Total dissolved solids from 971 to 1162 mg/L; alkalinity ranged from 500 to 675 mg/L; Total hardness [CaCo₃] from 306 to 380 mg/L; Acidity from 0.1 to 0.2 mg/L; COD (Chemical Oxygen Demand) from 232 to 1360 mg/L; BOD (Biological Oxygen Demand) from 58 to 380 mg/L; Nitrate [No-3] from 8 to 12 mg/L; Chloride[Cl-] from 224 to 276 mg / L; Sulphate [So₄-] from 191 to 239 mg/L; Phosphate [Po₄-] from 0.11 to 0.15 mg/L respectively. Parameters like BOD, COD from Cherlapally Lake were exceeded BIS and WHO standards. Because of these reason the Lake can be regarded as polluted Lake.

Keywords: physicochemical parameters, Cherlapally Lake-Hyderabad, water quality system.

Introduction

The main object of the study is to analyse physico-chemical parameters of the Cherlapally lake Water. The Experimental worksite is Cherlapally Lake located in Cherlapally village, Ranga Reddy District, Andhra Pradesh, India. The household of the Cherlapally village is 1064 and the population is 4260. Earlier lake water is not polluted. The lake water was main source for drinking and agriculture field. Rice was the main crop grown from the water of Cherlapally Lake. In the recent 15 years the Cherlapally Lake was receiving sewage waste water from Kapra Village and Kushaiguda areas. In addition to mostly heavy metals releasing industries such as, electrical and electronics, metal fabrications, forgings and casting, printing and packing and bore wells rigs and earth drilling equipment industries have come up in the surrounding of the lake. Therefore there is possibility of water pollution and heavy metal concentration in the lake. Similarly population of the Cherlapally village also increased. For this purpose experiments conducted to know the pollution status and water quality parameters in the Cherlapally Lake. The present study was carried out during the Aug 2013 to December 2013.

Material and Methods

The Experimental worksite is Cherlapally Lake located in Cherlapally village, Ranga Reddy District, Andhra Pradesh, India. The study was carried out During August to December

2013, from Cherlapally Lake, Ranga Reddy District, and A.P., India.

Sample collection: Samples of water were collected from 3 different sites of the Cherlapally Lake that are in-let of the lake (site-1), out-let of the lake (site-2), middle of the lake (site-3), and analysed for various Physico-Chemical parameters. The outcome results were compared with BIS standards (Bureau of Indian Standards) to find out the actual pollution status of the Lake.

Preservation and Storage: Standard sample procedures were followed for water sample collection, preservation and storage.

Water sample analysis: The chemical parameters like pH were measured using pH meter and noted the temperature on the spot of collection. TDS (total dissolved solids), TS (total solids), alkalinity, acidity, phosphates, Chlorides, Total Hardness (CaCO₃), Nitrates, Sulphates and electrical conductivity were estimated using standard methods¹. Total alkalinity was estimated by titrimetric method using methyl orange and phenolphthalein indicators. Total hardness was determined by EDTA titrimetry method using Eriochrome black-T as indicator. Acidity was determined by titration method. Dissolve oxygen was determined by Winkler's method. Chloride was determined by Argent metric method. Chemical oxygen demand was determined by open reflux method. Nitrate was determined by U.V- Spectrophotometric method. Phosphorus was

determined by vanado molybdo phosphoric acid colorimetric method.

not much variation in all sites (figure 2). This observation has been true for the several water bodies in India³⁻⁶.

Results and Discussion

The result of the physical- chemical parameters was analysed in 3 different sites, and compare with the BIS Standards.

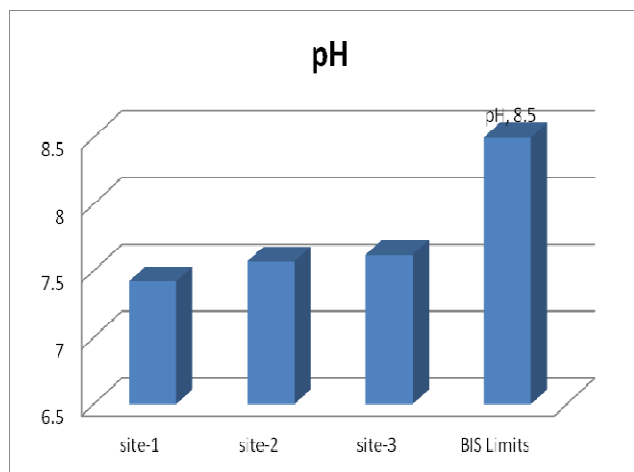


Figure-1
 Showing the pH values of three various sites of the Cherlapally Lake during the year-2013

Recorded pH ranged from 7.42 to 7.62. The highest value observed in site-3 (middle of the lake) and lowest in site-1(in-let) of the Cherlapally Lake. Compare to BIS standards pH range of 6.5 to 8.5 is normally accepted. This shows that the pH of water samples was neutral, does not cause severe health hazard. Similar findings were recorded Janakiraman et al².

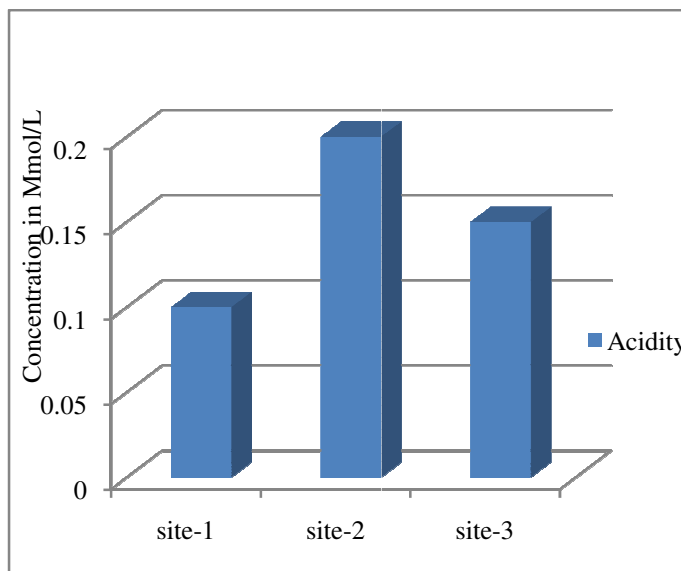


Figure-3
 Showing Acidity concentrations in M moles /L sites (1to3) of the Cherlapally Lake during the year-2013

The acidity content was observed 0.1 to 0.2 M mol/L. The maximum acidity was observed in site- 2 (out-let) of the lake, and minimum was observed in site-1 (in-let) of the lake figure-3. Similar observations found by Furhan Iqbal et al⁷.

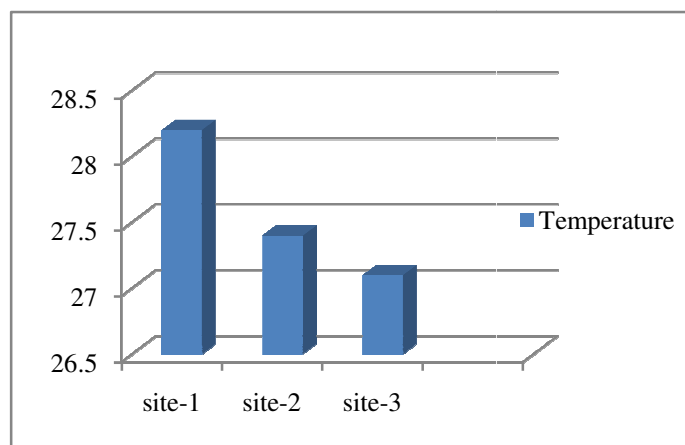


Figure-2
 Showing Temperature values in sites (1 to 3) in degree centigrade of Cherlapally Lake during the year-2013

The temperature of Cherlapally Lake was recorded 27.1⁰C to 28.2⁰C. The maximum value observed in site-1(in-let), and minimum value is site-3 (middle of the lake). Temperature is

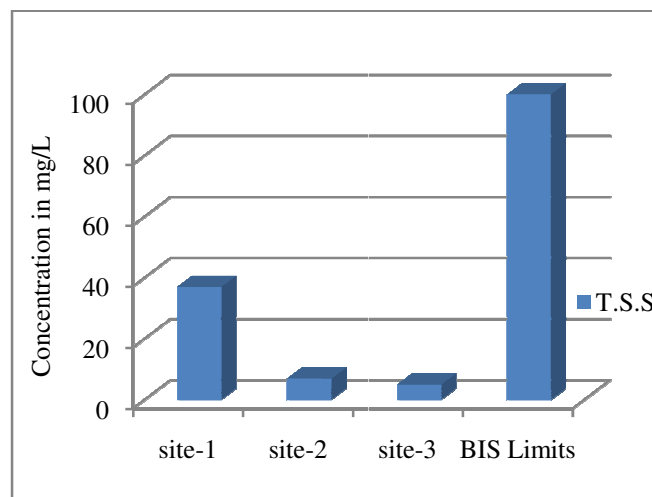


Figure-4
 Showing the concentration of T.S.S (mg/L) in sites (1-3) of the Cherlapally Lake during the year-2013

The total suspended solids content was observed from 3 to 37mg/L. The highest value was observed in In-let (site-1) and lowest observed in site-3 (middle of the lake). Figure-4. The T.S.S concentration was lower compare to BIS standard.

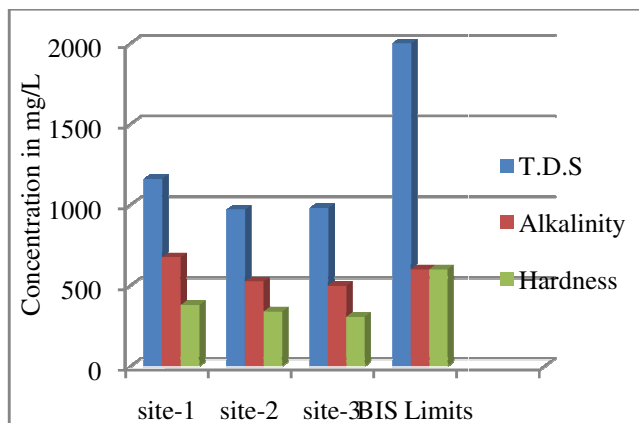


Figure-5

Showing, the results of the T.D.S, Alkalinity and Hardness in three sites of Cherlapally Lake during the year-2013

The TDS (Total Dissolved Solids) concentration was observed from 971 to 1162 mg/L. The maximum concentration was observed in site-1 (in-let) and minimum concentration observed in site-2 (out-let) of the Cherlapally Lake, figure-5. Similar observations found by Dorairaju et al⁸.

The total alkalinity concentration observed from 500 to 675 mg/L. The maximum value observed in site-1 (in-let) of the lake, and minimum value observed in site-3 (middle) of the Cherlapally Lake, Figure-5. Similar results reported by Dorairaju et al⁸.

Total hardness concentration observed from 306 to 380 mg/L. There is no much difference in all sites. The hardness concentration was maximum in site-1 (in-let) and minimum concentration in site-3 (middle) of the Cherlapally Lake, Figure-5. TDS, Alkalinity, Hardness concentration in all sites of the Cherlapally Lake water analyzed were less than the BIS standards. Similar results reported by Khandekar et al⁹. TDS concentration was recorded maximum in all the 3 sites when compare to alkalinity and hardness concentrations of the Cherlapally Lake.

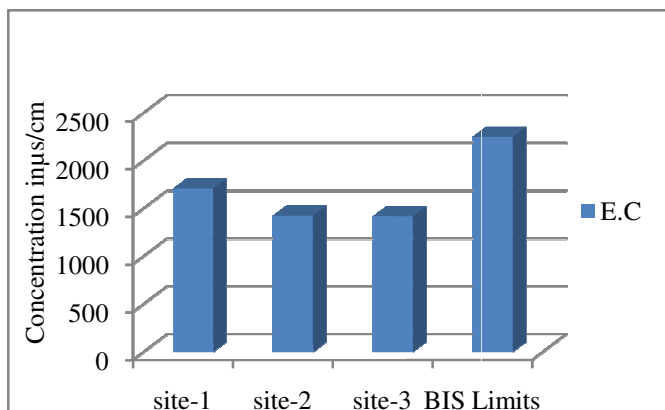


Figure-6

Showing Electrical Conductivity values of different sites (1 to 3) of the Cherlapally Lake during the year-2013

In present investigation the EC (Electrical Conductivity) concentration was observed from 1419 to 1709 µs/cm. The maximum EC concentration was observed in site-1 (in-let) and minimum concentration was observed in site-3 (middle) of the Cherlapally Lake, figure-6. Electrical Conductivity concentration is lower when compare with BIS guidelines. Similar observation was found by Dorairaju et al⁸.

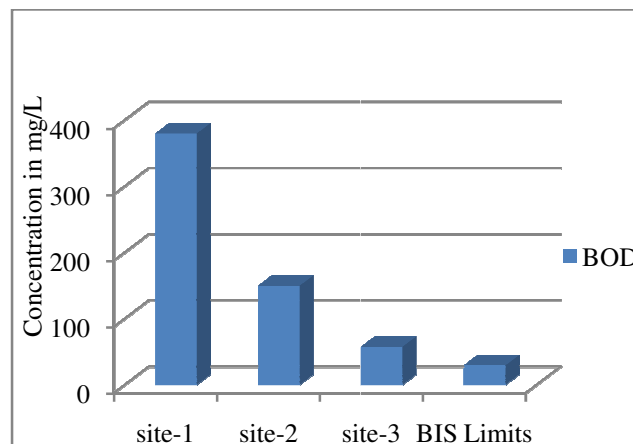


Figure-7

Showing the concentration of Biological Oxygen Demand (mg/L) in sites (1-3) of the Cherlapally Lake during the year-2013

BOD (Biological Oxygen Demand) concentration was observed 58 to 380 mg/L. The maximum value was observed in site-3 (middle) and minimum value was observed in site-1 (In-let) of the Lake. There is higher difference in all sites, figure-7. BOD concentration was higher when compare to BIS standards. Similar findings were reported by Singh et al¹⁰ and Piyush et al¹¹.

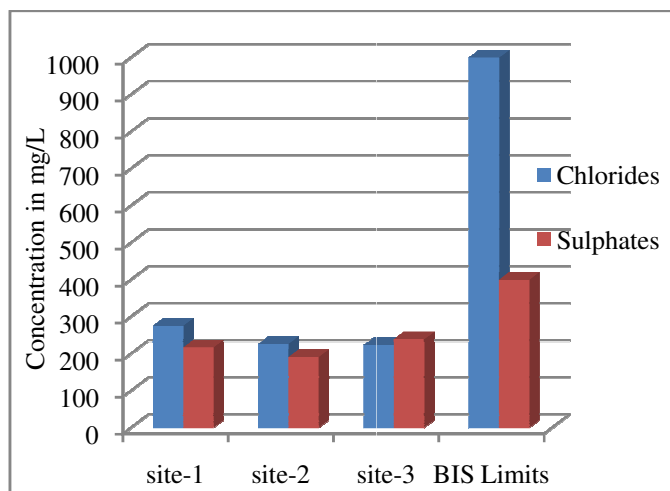


Figure-8

Showing the concentration of Chlorides and sulphates values (mg/L) in sites (1-3) of the Cherlapally Lake during the year-2013

The chloride concentration observed in 224 to 412 mg/L. The maximum value observed in site- 1 (in-let) and minimum one is site-3 (middle) of the lake. Chloride there is no much variation in all sites, Figure-8. Similar trend was reported earlier^{12,13}.

Sulphates concentration was observed in 191 to 297 mg/L. The maximum concentration observed in site-3 (middle of the lake) and minimum one is site-2 (out-let) of the Cherlapally Lake, figure-8. Similar observations found by Dorairaju et al⁸.

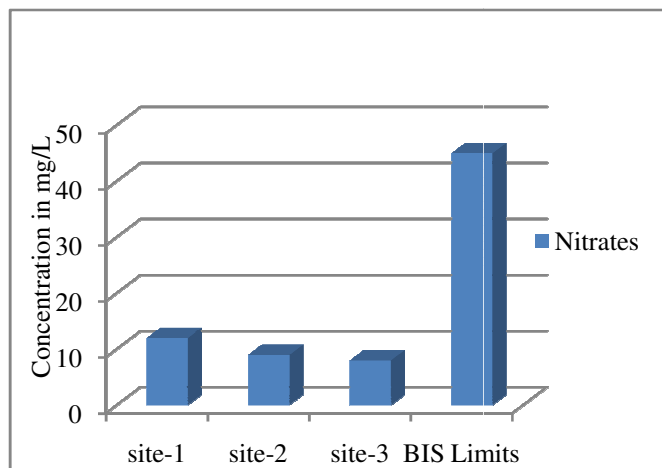


Figure-9

Showing the concentration of nitrates (mg/L) of different sites (1-3) of Cherlapally Lake during the year-2013

Nitrate concentration ranged from 8 to 12 mg/L. The maximum value observed in site-1 (in-let) and the minimum concentration observed in site-3 (middle) of the Cherlapally Lake. There is no much difference in nitrate concentration in all three sites of the Lake, figure-9. Nitrate concentration was lower when compare to BIS guidelines. Similar observations were found¹⁴. Nitrate concentrations were encountered in water impacted by intensive fertilizer application, or septic effluents. This can lead to serious water contamination.

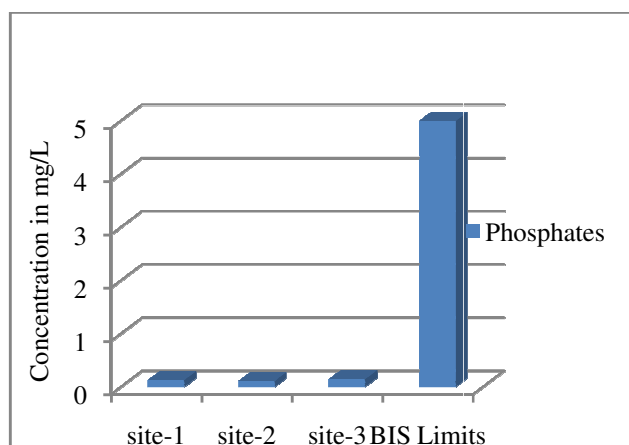


Figure-10

Showing the concentration of Phosphate (mg/L) in sites (1-3) of Cherlapally Lake during the year-2013

Phosphorus concentration was observed ranged from 0.11 to 0.15mg/L. The maximum concentration observed in site-3 (middle) and minimum concentration observed in site-2 (out-let). There no much difference in all sites of the Cherlapally Lake, Figure-10. Phosphates concentration was lower when compare to BIS standards. Similar observations 0.719 to 1.920 mg/L were reported by Basavaraja et al¹³ and Chakravarthi K.R.¹⁵.

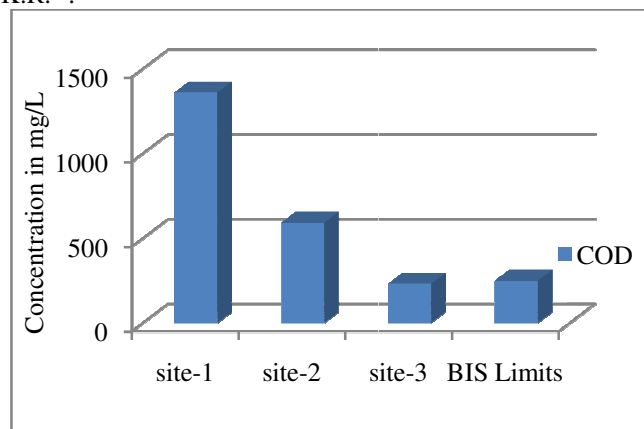


Figure-11

Showing the concentration of Chemical Oxygen Demand (mg/L) in sites (1-3) of the Cherlapally Lake during the year-2013

The COD (Chemical Oxygen Demand) concentration observed ranged from 232 to 1360 mg/L. The maximum range observed in site-1 (In-let) and minimum range observed in site-3 (middle) of the Cherlapally Lake, Figure-11. COD concentration was higher when compare to BIS standards. Similar findings were observed by Sahoo et al¹⁶.

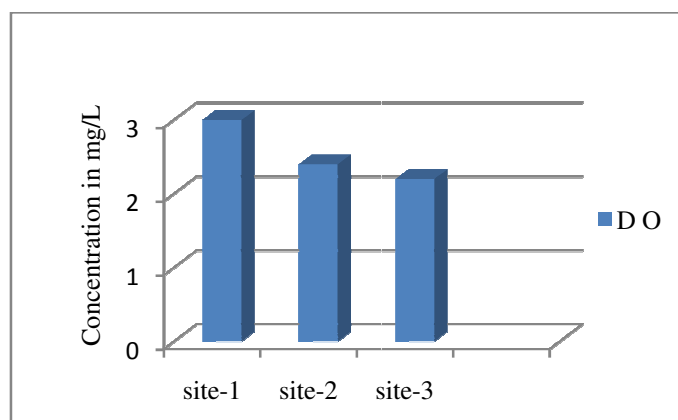


Figure-12

Showing the concentration of Dissolved Oxygen (mg/L) in sites (1-3) of the Cherlapally Lake during the year-2013

The DO (Dissolved Oxygen) concentration observed ranged from 3 to 2.2 mg/L. The highest range observed in site-1 (In-let) and lowest range observed in site-3 (middle) of the Cherlapally Lake (fig. 12). Similar findings were observed by Dorairaju et al⁸.

Conclusion

All physic- chemical parameters were compared against the BIS. The outcome of results present study showed that physic chemical quality of water samples from Cherlapally Lake was polluted. The following parameters were present in very high concentration namely BOD, COD in all the 3 sites of the Cherlapally Lake. Acidity, TSS, TDS, Hardness, EC, Chlorides, Sulphates, Nitrates, Phosphates were present in below BIS standards in all 3 sites of the Cherlapally Lake. In site-1(in-let) of the Cherlapally Lake Alkalinity is high compare to BIS standards and site-2(out-let), site-3(middle) the Alkalinity concentration is below compare to BIS standards. Because of these values of parameters the lake is polluted which require remedial measures and protection in order to protect the health of man and animals and other organisms.

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