

Physico-Chemical Characteristics of Kalki Cheruvu in Kamareddy District of Telangana State

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ABSTRACT: Kalki Cheruvu, a freshwater lake. The structure and composition diversity of the phytoplankton community in aquatic ecosystems were influenced by several physico-chemical parameters. Distribution of phytoplankton is greatly influenced by hydrochemical physical variables. These variables have a significant impact on the phytoplankton and population. In the present work an attempt was made to assess the Physico chemical Parameters of a water body in Telangana state for a period of one year February 2023 to January 2024. Water samples were collected from different sampling stations of Kalki Lake labeled as S1, S2, S3, S4 Samples were collected at seasonal interval in order to assess physico chemical parameters such as temperature, pH, turbidity, total dissolved oxygen, hardness of water, carbonates, bi carbonates, chlorides, magnesium, nitrates, biological oxygen demand, chemical oxygen demand, total alkalinity, total suspended solids, total dissolved solids, following the standard methods of APHA (2005)[1]. The results revealed that there was significant variation in physicochemical parameters and most of the parameters were found in the normal range of the permissible limit and thus indicated better quality water. It has been found that the water was suitable for drinking purposes.

KEYWORDS: Physicochemical Parameters, Kalki Lake, Telangana state.

INTRODUCTION

The presence of water is crucial for all forms of life on Earth and for maintaining a stable climate. There are few chemicals with such a significant impact on the natural world as this one. The physicochemical and biological characteristics of water are often used to define its quality. (Bajic, S.J., et.al 1985). People get water-borne infections as a result of drinking polluted water. That turbidity, nitrate, and phosphate are among the testable parameters. (Bhateria, R., & Jain, D. 2016). Lakes are an important element of the natural environment that defines both landscape and its ecological functioning. During the last few decades' lakes all over the World have become the focus of the physico-chemical and environmental investigation as they exhibit enormous diversity based on the genesis, geographical location hydrological regimes and substrate factors. Water quality constitute various biotic and abiotic factors associated with the ecosystem. The Maintenance of healthy ecosystem is depended on the physicochemical properties of water and biological diversity. The quality of the ecosystem was depended on biological characteristics (Medudhula Thirupathaiah., 2012)[2]. Water Quality indicates the relation of all Hydrogeological properties; it reflects the biotic and abiotic status of the ecosystem. (Smitha AD, 2013)[3]. Abiotic and biotic factors of an ecosystem were interdependent and the fluctuation of abiotic one frequently affects the biotic factors changing their quantity and biodiversity physical characteristics like temperature, light intensity, transparency, pressure, conductivity and whereas chemical properties like levels of dissolved oxygen, free carbon dioxide, alkalinity, hardness, phosphate and nitrate levels of the lake water highly govern the aquatic life and determine the trophic status of the water body. Abiotic factors are usually the governing forces of the environment and influence the wellbeing, distribution of organisms and functioning of the ecosystem. The productivity of the freshwater community that determines the fish growth is regulated by the dynamics of its physico-chemical and biotic environment (Wetzel, 1983)[4]. The present investigation is based on the analysis of water quality in relation to physicochemical parameters.

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MATERIALS AND METHODS

Study site:

Kalki Cheruvu, located in Banswada is one of the prominent lake present in the Kamareddy district Telangana state of India. It coordinates 17°25'15.8"N 78°5'16.200E (Fig.1)



Fig No.1 Study Site Kalki Cheruvu Over View, Google Map

Sample Collection:

The water will be collected from the lake once a month at 8:30 a.m. in a 1 l container for physical- chemical examination. As per the American public health association (APHA2012), water pollution control federation (WPCF), and American water association (A.W.A), certain physicochemical characteristics were studied on-site while others were analysed in the laboratory. Multiple samples of all variables were collected and examined and the mean values were calculated.

Physico chemical parameters

- The ambient water temperatures at the surface were assessed using a Mercury thermometer calibrated in Celsius.
- Turbidity was measured by a turbidity meter.
- used a PH meter to determine the concentration of hydrogen ions.
- Transparency of the water column was assessed using a secchi's disc, while the concentration of dissolved oxygen (DO) determined using the UN modified winkler's technique (Ellis et al.,1984).
- the release of co₂ used titrimetric analysis.

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Using a 0.1N NAOH solution and phenolphthalein indicator, titrate 100 ml of the sample.

- Biological oxygen demand (B.O.D)-by used winkler's modified method.
- The total dissolved solids (TDS)were measured using methodology described by Saxena (1987).
- The levels of the phosphate,silicate,calcium and magnesium were determined using the APHA(1989) method, whereas the concentration of chloride was determined using the method described by APHA(1995).

RESULTS AND DISCUSSION

The results obtained for various Physico-chemical parameters assessed such as Temperature, total dissolved solids (TDS), pH, Carbonates, Bicarbonates, biological oxygen demand(BOD), Chemical Oxygen Demand(COD), Total hardness, dissolved oxygen, Magnesium, Phosphates, total suspended solids(TSS), chlorides, sulphates, nitrates, are depicted as shown in the form of Tables and Figures.

Temperature:

The measurement of temperature is one of the most primary factor, which plays an important role in the metabolic activities of the organism .in kalki lake it was observed ,33.4⁰C which is highest in summer season,22.1⁰ C(table -1,figure-1) recorded was lowest in winter season .Water temperature influenced aquatic weeds and algal blooms (Zafer, 1968)[7].similar findings were noted by chinnaiah et al(2011).

pH:

pH of water is an important environmental factor which affects the biology and the lifecycle of biotic life in aquatic ecosystems.the pH range has been found to be crucial in algal development. chisty(2002).the pH ranges 8.3which was highest in rainy season 7.2 low in winter season . pH was estimated by using a pocket pH meter at the spot in lake. pH range between 5 to 8.5 is the best for plankton growth.(table-1,Figure-2).

Carbonates:

Carbonate is the prime contributor for maintaining pH of a water body and ends its role is of vital importance (Hegde Et.al,2005)[10].The highest amount of carbonates was found to be 22.5 mg/l in summer and the lowest value was recorded as 15 mg/l in rainy. (Table-1, Figure-3).

Bicarbonates:

Bicarbonate plays an important role in water biota. Higher value of bicarbonate leads to alkaline pH. The greatest amount of bicarbonate was identified as 45.73 mg/l in summer and lowest value was 30.5mg/l in winter (Table-1, Figure-4).

Dissolved Oxygen:

DO observed in the Dissolved oxygen is an important parameter in water quality assessment as it regulates many metabolic and physiological processes of biotic components. It indicates the pollution in water bodies.The DO values varied from 8.5mg/l to 10.14 mg/l. Highest in the rainy season and lowest was observed in summer . (Table-1, Figure-5). Lower DO indicate organic pollution in lakes as levels in water drop below 5.0 mg/l, many life forms are put under pressure (Bowman Et. al.,2008) [11].

Biological Oxygen demand:

The highest concentration of BOD 8.5mg/L recorded in summer Whereas lowest value 5.9mg/L was recorded in rainy (Table-1, Figure-6). High amounts of waste along with rain water from the surrounding and addition of organic waste in lakes by certain human activities are also responsible for the increase inBOD (Solanki HA 2007)[12]. High biological oxygen in summer was several microbes in water that accelerated their metabolic activities.

Chemical Oxygen demand:

The highest value 5.62 mg/l lowest values 4.98 mg /l were recorded (Table-1, Figure-7). Highest values observed in summer and lowest values were recorded during the rainy season. The Values of COD in conjugation with BOD are useful in knowing the toxic condition and presence of biologically resistant organic substances. (Sharma et al.,2010)[13]. The estimation of COD along with BOD is helpful in indicating toxic conditions and the presence of non-biodegradable substances in the water (Sawyer, McCarty and Parkin, 2003)[14].The High COD values indicates that some degree of non-biodegradable oxygen demanding pollutants are present in the water. Values recorded in table-1,Figure-7.

Total Hardness:

The maximum values 198.00 mg/Lis recorded during the summer (Table-1,Figure-8).Lowest values 166.00mg/L were recorded in the rainy season.High range organic components, detergents, chlorides, high temperatures are influenced to decrease in water

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volume and they increase the hardness. The lowest amount of total hardness was recorded during the winter season due to low concentration of calcium and magnesium. (SalveBS 2006)[15].

Magnesium:

The maximum value 35 mg/l was in summer and the lowest value was 25 mg /L in winter (Table-1, Figure-9). Lowering of magnesium levels reduces the phytoplankton population (Govindan, 1991)[18]. The high values observed in summer could be due to evaporation, increasing the concentration of magnesium (SharmaR, 2010)[19].

Total Dissolved Solids:

Dissolved solids are present in water in natural condition. The Dissolved solids were composed mainly of carbonates, bicarbonates, chlorides, sulphates, calcium, phosphate and iron (Trivedy, 1986)[20]. High TDS value for Kalki lake was estimated to be 360 mg/l in summer and lower was 320 mg/l in winter (Table-1, Figure-10). The contamination of domestic wastewater, garbage and other related wastes in the surface water body can be one among the reasons for increasing TDS measure (Reasoner, 2004) [21].

Total Suspended Solids:

TSS average values in Kalki Cheruvu were recorded during research, highest value recorded in summer season 52 mg/l, low value was recorded in winter season 45 mg/l. TSS data recorded in table-1, Figure -11.

Chlorides:

It is an inorganic anion in water. The Higher Concentration of chloride 156.25 mg/l. estimated in summer and lower concentration 126.25 mg/l recorded in rainy (Table-1, Figure-12). The Higher concentration of chloride is considered to be an indicator of higher pollution due to higher organic waste of animal origin (Mishra Et Al 2007) [22]. The Concentration Of chloride is directly correlated to the pollution level (Munawwar, 1970)[23]. The lowest value of chloride recorded during

Phosphates:

Phosphates were recorded very low concentration in Kalki Cheruvu and the concentrations were influenced by domestic sewage and, agricultural waste, releases into the aquatic system. The Highest value of phosphate recorded 67 mg/l in winter and lowest value of phosphate recorded 54 mg/l in rainy season. (Table-1, Figure -13).

Sulphates

The maximum value 36 mg/l was recorded in summer season and Minimum of 24 mg/l in rainy during the period of investigation. Sulphur deficiency can inhibit algal growth indirectly by hindering chlorophyll synthesis (Cole, 1979) [25]. (Table-1, Figure-14).

Nitrates:

The estimated maximum amount of nitrates 1.15 mg/l in the rainy season and minimum amount 0.64 mg/l were recorded in summer. (Table-1, Figure-15) Nitrogen is a component in nitrate, nitrite, ammonia, urea, and dissolved organic compounds in an aquatic environment. The highest amount of nitrate concentration was known to support the formation of blooms. (Udama, AU 2014)[26].

Table 1. Seasonal variation of physico-chemical parameters

Parameters with units	Summer			Rainy			Winter		
	February	April	May	June	August	September	October	November	December
Temperature	31.2	30.2	33.4	27.2	26.2	25	23.5	23.6	22.1
pH	7.6	7.9	7.6	8.1	8.3	7.5	7.2	7.9	7.3
Carbonates(mg/l)	22.5	21.2	20.3	16.2	15	16.5	20.3	22.1	20.1
Bicarbonates(mg/l)	41.2	45.73	42.1	40.2	41.2	42	31.2	30.5	36.2
Dissolved oxygen(mg/l)	8.5	8.9	9.2	9.5	10.14	9.8	8.7	8.6	8.7

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BOD(mg/l)	8.5	7.4	7.2	6.2	5.9	6.3	7.5	7.2	7.6
COD(mg/l)	5.62	5.1	5.5	5.2	4.98	5.1	5.52	5.42	5.35
Total hardness(mg/l)	198	185	182	166	169	174	176	179	174
Magnesium(mg/l)	35	33	32	34	32	34	27	25	26
TDS(mg/l)	360	350	330	330	340	350	340	320	330
TSS(mg/l)	52	49	48	50	48	46	46	45	47
Phosphates(mg/l)	62	59	55	55	54	56	63	67	59
Chlorides(mg/l)	156.25	145.5	152	130	126.25	125.25	148.25	139.25	140.5
Sulphates(mg/l)	36	33	35	28	24	26	32	29	31
Nitrates(mg/l)	0.64	0.73	0.9	0.89	1.15	0.85	1.12	0.8	0.9

Temperature

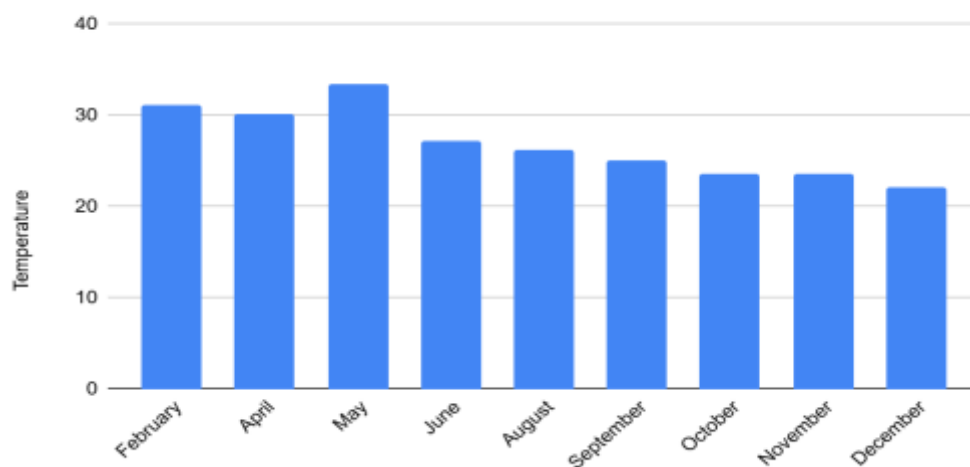


Figure.1: Showing variation Temperature

pH

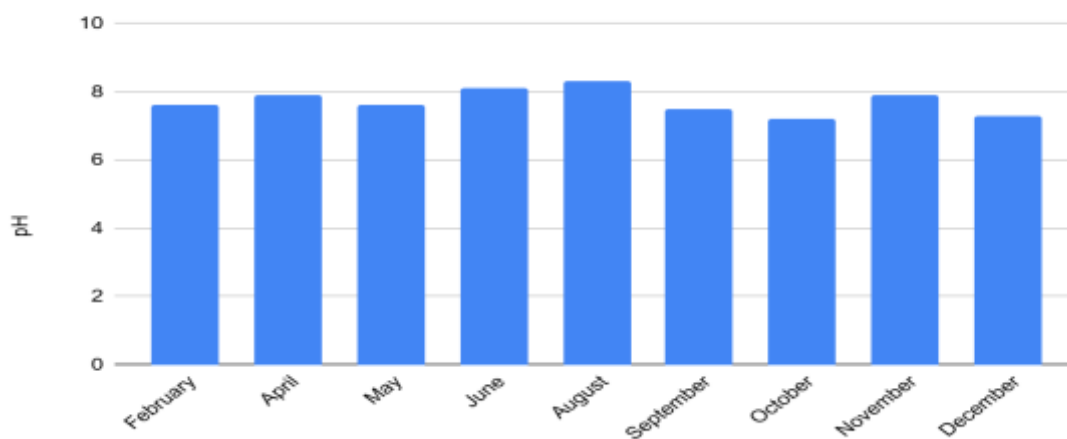


Figure 2: Showing Variation in pH

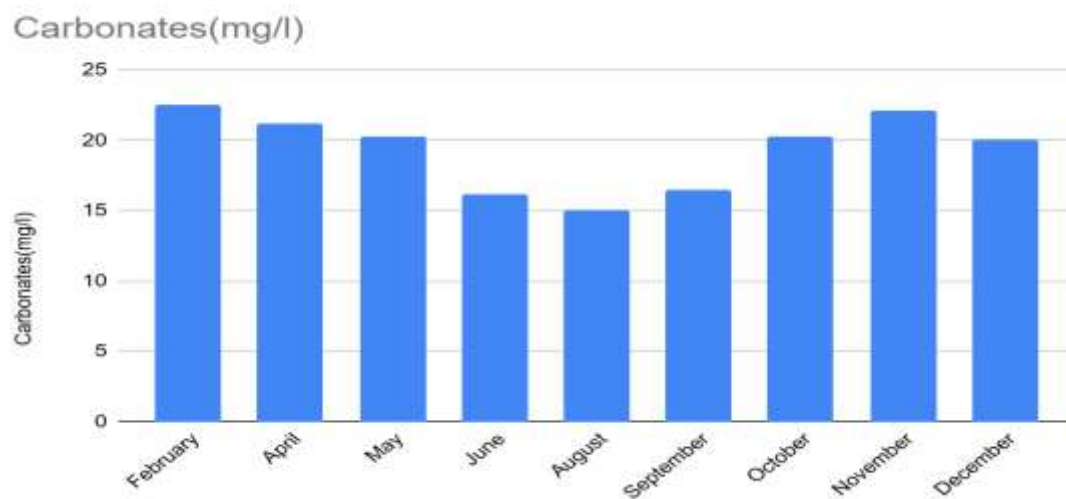


Figure3. Showing amount of carbonates

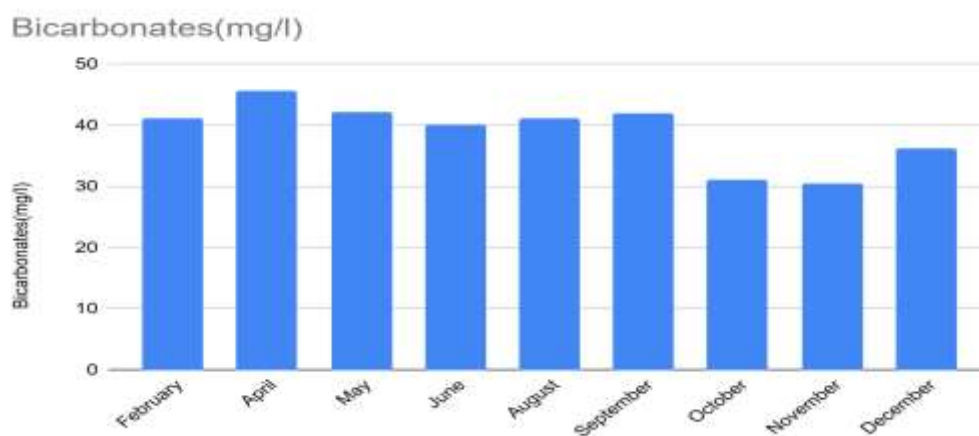


Figure 4: showing Amount of Bicarbonates

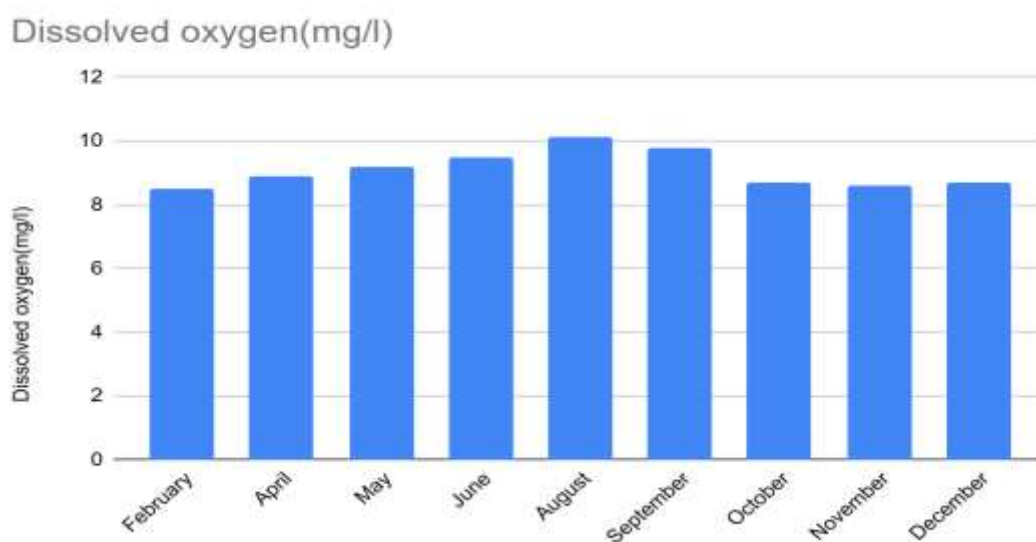


Figure 5: showing variation in Dissolved oxygen

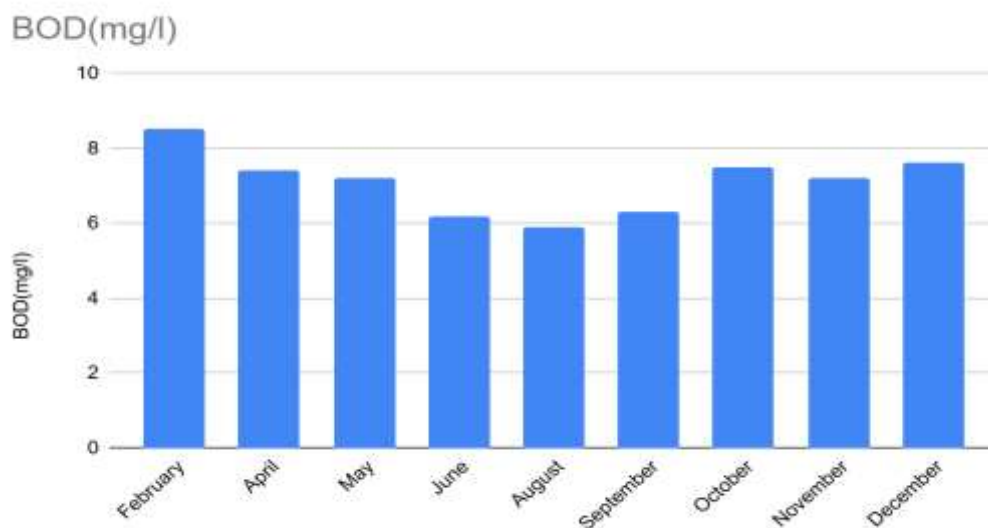


Figure 6: showing variations in Biological Oxygen Demand

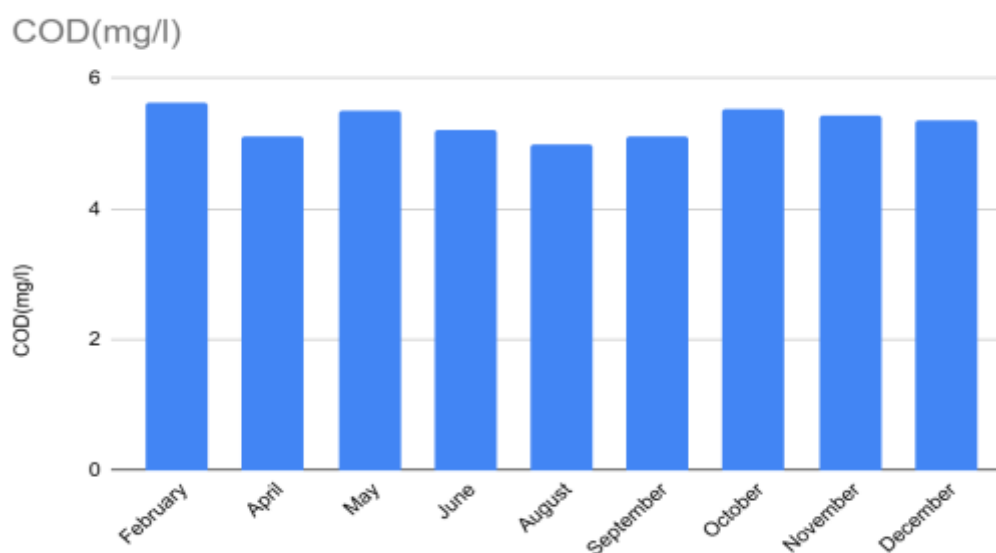


Figure 7: Chemical Oxygen Demand

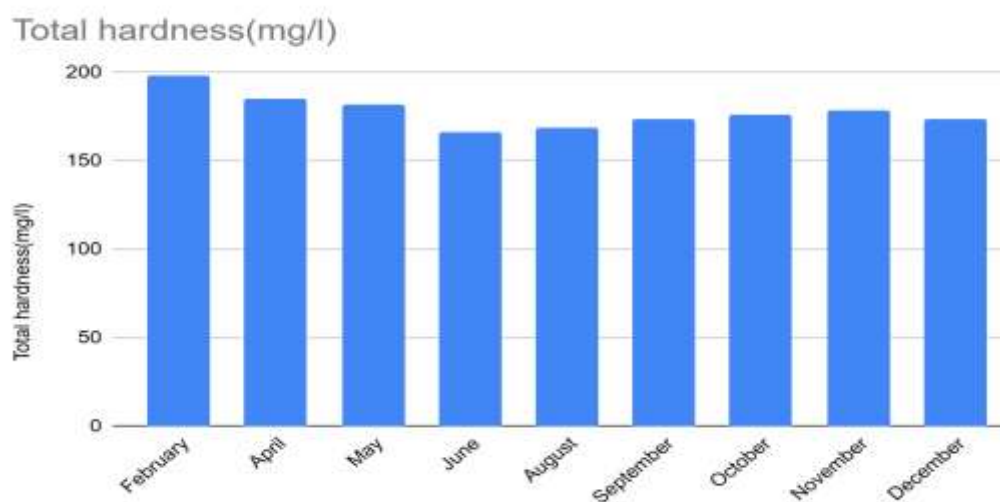


Figure 8: showing variation in Total Hardness

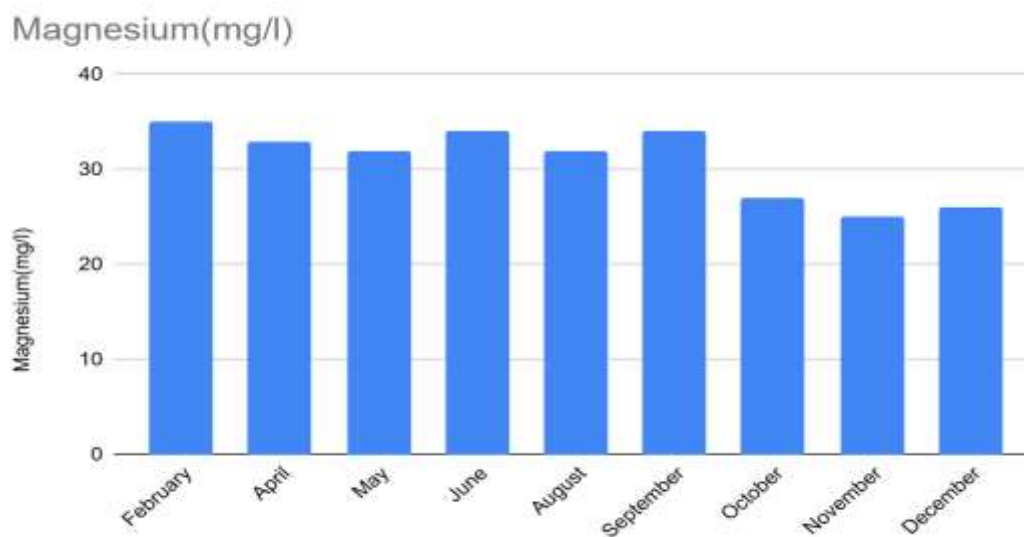


Figure 9: showing Amount of Magnesium

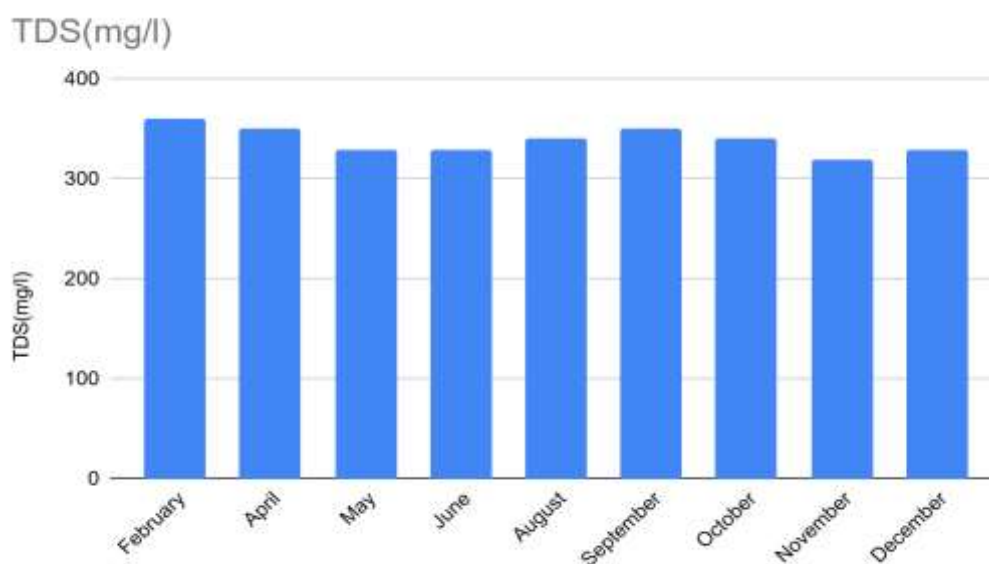


Figure 10: showing variations of Total Dissolved Solids

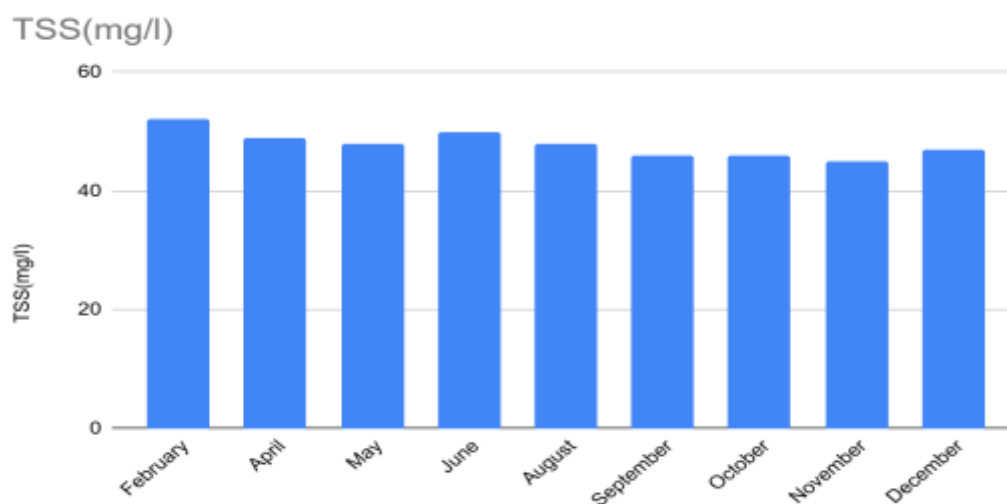


Figure 11: showing variations of Total Suspended Solids

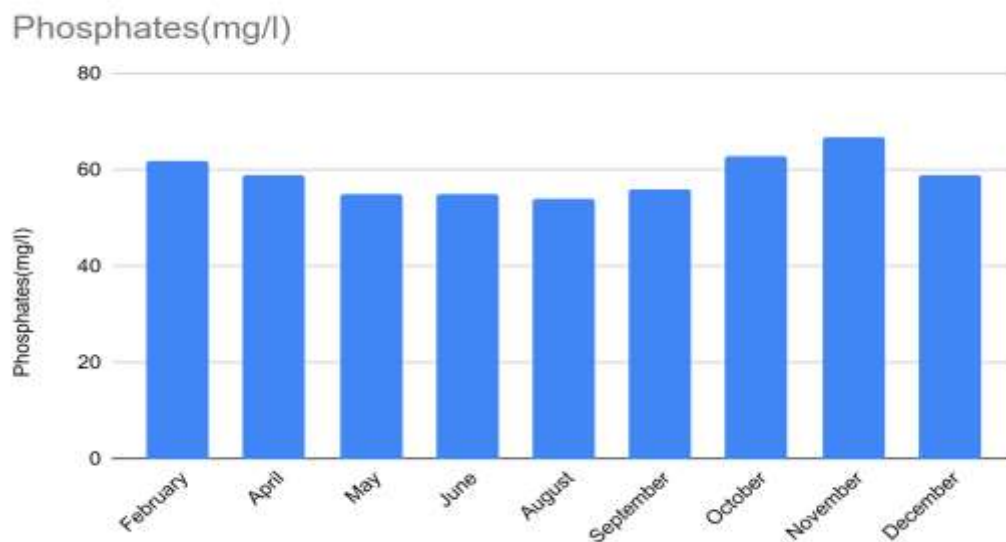


Figure 12: showing Amount of Phosphates

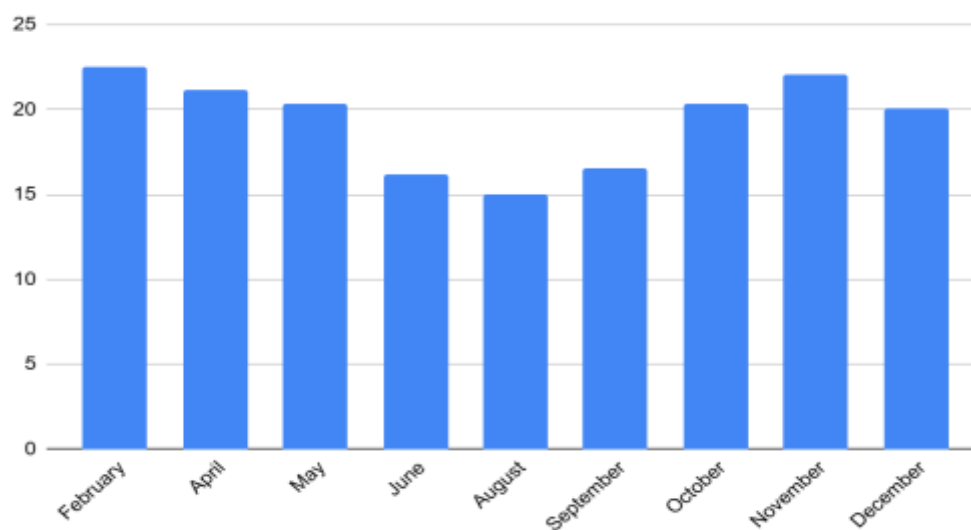


Figure 13: showing amount of Chlorides

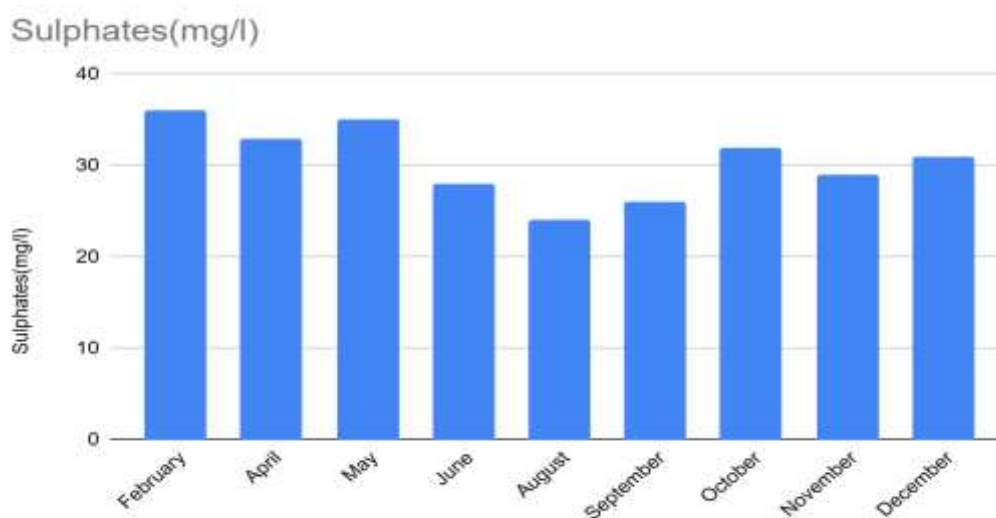


Figure 14: showing Amount of Sulphates

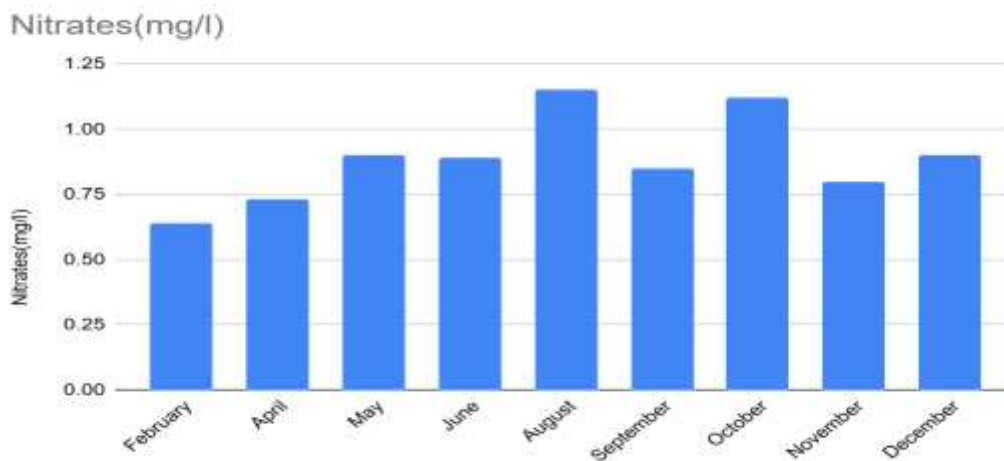


Figure 15: Showing Amount of Nitrates

CONCLUSION

In the present study the result of analysis of physico -chemical parameters had indicated that human activity and influx of domestic waste into the lake led to eutrophication. Seasonal variations in parameters such as temperature, pH,dissolved oxygen,nutrient levels played a vital role in shaping the composition and abundance of phytoplankton communities.

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