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Analysis of Physico Chemical Parameters of Medchal Lake in Telangana State

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ABSTRACT

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 during January 2019 to December 2019. Water samples were collected from four different sampling stations of Medchal Lake labeled as S1, S2, S3, and S4. Samples were collected at monthly interval in order to assess physico chemical parameters such as temperature, pH, turbidity, total dissolved solids, total hardness, chlorides, phosphate, nitrates, sodium, potassium, dissolved oxygen and biological oxygen demand, following the standard methods of APHA (2005)[1]. The results revealed that there was significant variation in some physicochemical parameters and most of the parameters were found to be in normal range of permissible limit and thus indicated better quality of lake water. It has been found that the water was suitable for drinking purpose

Keywords : Physicochemical parameters, Medchal Lake, Telangana state

I. INTRODUCTION

Lakes are an important element of 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 environmental investigation as they exhibit enormous diversity based on the genesis, geographical location hydrological regimes and substrate factors.

Water quality constitutes various biotic and abiotic factors associated with the ecosystem. The maintenance of healthy ecosystem is dependent on the physico chemical properties of water and biological diversity. The quality of ecosystem is dependent on the physico-chemical and biological characteristics (Medudhula Thirupathaiah., 2012)[2].

Water quality indicates the relation of all Hydrobiological properties; it reflects the botic and abiotic status of ecosystem. (Smitha AD, 2013)[3].

Abiotic and biotic factors of an eco-system are interdependent and the fluctuation of abiotic ones frequently affects the biotic factors changing their quantity and biodiversity physical characteristics like

temperature,light intensity,transparency, pressure, conductivity and water cur-rent 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 well being, distribution of organ-isms 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 involves the analysis of water quality in relation to physicochemical parameters.

II. MATERIALS AND METHODS

a. Study area: Pedda Cheruvu, located in Medchal, is listed with the Hyderabad Metropolitan Development Authority's (HMDA) Lake Protection Committee. The lake was surveyed in 2013 and according to that report, the water spread area is about one and a half acre full tank level area is 356 acres and its bund length is 1,200 meters. Lake Latitude 17O.251 17.0004" N, Longitude 780.331 16.3800" E. It is 30 km away from Secunderabad Railway Station and 45 km from the Rajiv Gandhi International Airport. The lake was once used to provide water for agriculture and allied activities and was a source of drinking water. The lake attracted migratory birds in the winter. According to locals, this is the largest lake in the mandal consisting of 18 villages including Medchal village. Hence it is popularly known as Pedda Cheruvu .It is said that it has been in existence since the Nizam's Era.

b. Analysis of water: The surface water samples were collected from four sampling stations namely, S1, S2, S3, and S4 between 8 and 10 am from January 2019 to December 2019. To collect water samples, cleaned and rinsed plastic containers of two-liter capacity were used. Water samples were tested for different physico-chemical parameters. The chemical parameters as pH and temperature were measured in the field using a pH meter and digital thermometer. Further analysis was carried out as per APHA method (APHA 2005)[5], and standard literature, Trivedi and Goel (1986)[6].

III. RESULTS AND DISCUSSION

The results obtained for various Physico-chemical parameters assessed such as Temperature, pH, Carbonates, Bicarbonates, Dissolved oxygen, biological oxygen demand, Chemical oxygen demand, Organic matter, Total hardness, Calcium, Magnesium, Chlorides, Phosphates, Sulphates, Nitrates, Nitrites, Silicates, Total dissolved solids, are depicted as shown in the form of Tables and Figures

a. Temperature: The measurement of temperature is one of the most primary factors, which plays an important role in the metabolic activities of the organism The temperature showed a range ranged from 21.7° C to 31.14° C during the study period, January 2019 to December 2019 (Table-1, Figure-1).

The maximum temperature was recorded in the month of May and lowest was in December month. Water temperature influenced aquatic weeds and algal blooms (Zafer, 1968)[7].

b. pH: pH of water is an important environmental factor which effects the biology and the life cycle of the biotic life. It is recorded in the range of 7.2 (Sep) to 8.5(may) at all stations. pH was estimated by using pocket pH meter at the spot in lake. pH value is very important for plankton growth (Chisty,2002)[8].According to (Umavathi *et.,al.* 2007)[9]. pH range between 5 to 8.5 is best for plankton growth. (Table-1, Figure-2).

c. 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 52.94 mg/l in May and the lowest value was recorded as 26.64 mg/l in June. (Table-1, Figure-3).

d. Bicarbonates: Bicarbonate play an important role in water biota .Higher value of bicarbonate leads to alkaline pH. The greater amount of bicarbonate was identified as 250.64 mg/l in August and lowest value is 140.56 mg/l in October. (Table-1, Figure-4)

e. Dissolved Oxygen: Dissolve 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 8.2 to 11.4 mg/l. Highest DO observed in the month of November and lowest was observed in month of March. (Table-1, Figure-5). Lower DO indicate organic pollution in lake as DO levels in water drop below 5.0 mg/l, many life forms are put under pressure (Bowman *et. al.,* 2008)[11].

f. Biological Oxygen Demand: The highest concentration of BOD 10 mg/L recorded in April whereas lowest value 2.62 mg/L was recorded in August (Table-1, Figure-6). High amount of waste along with rain water from the surrounding and addition of organic waste in lake by certain human activities which also be responsible for the increase in BOD (Solanki HA 2007)[12]. High biological oxygen in summer was several microbes in water accelerated their metabolic activities.

g. Chemical Oxygen Demand: The highest value 31.00 mg/L lowest values 10.00 mg /L were recorded (Table-1, Figure-7). Highest values observed in summer and lowest values were recorded during rainy season. The values of COD in conjugation with BOD are useful in knowing the toxic condition and presence of biologically resist 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 were present in the water. The estimated greater amount of COD 30 mg/l was recorded in April and lowest of 11 mg/l I in August (Table-1, Figure-7).

h. Total hardness: The maximum values 260.00 mg/L is recorded during the month of March (Table-1, Figure-8). Lowes values 120.00mg/L were recorded in the month of August. High range organic components, detergents, chlorides, high temperature are influence to decrease in water volume and they increase the hardness. The lowest amount of total hardness was recorded during winter season due to low concentration of calcium and magnesium. (Salve BS 2006)[15].

i. Calcium: Calcium is an important nutrient for aquatic organism .Sewage waste might also be responsible for the increase in amount of calcium (Table-1, Figure-9), (Udhya Kumar et al., 2006)[16].The lowest amount of calcium in water was recorded during winter season due to calcium absorbed by the large number of organisms for shell construction, bone building and plant precipitation of lime. (Solanki, HA 2012)[17]. The maximum value of calcium 60.49 mg/l were noticed in August and minimum 35.26 mg/l January.

j. Magnesium: The maximum value 40.24 was in the month of April and the lowest value was 24.78 mg /l in December (Table-1, Figure-10). Lowering of magnesium level reduces the phytoplankton population (Govindan, 1991)[18].The high values observed in summer could be due to evaporation, increasing the concentration of magnesium (Sharma R, 2010)[19].

k. Total Dissolved Solids(TDS): Dissolved solids are present in water in natural condition. The Dissolved solids are composed mainly of carbonates, bicarbonates, chlorides, sulphates, calcium, phosphate and iron (Trivedy, 1986)[20].High TDS value for Medchal lake was estimated to be 495 mg/l in the month of April and lower was 310 mg/l in the month of August (Table-1, Figure-11). The contamination of domestic waste water, garbage and other related wastes in the surface water body can be one among the reasons for increasing in TDS measure (Reasoner,2004)[21].

l. Chlorides: It is an inorganic anion in water. The higher concentration of chloride 198.96 mg/l estimated in April and lower concentration 126.25mg/l recorded in July (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 (Munnavar,1970)[23].The lowest value of chloride recorded during monsoon season due to the dilution of lake water by rain (Shastry 1970)[24].

m. Sulphates: The maximum value 36 mg/l was recorded in the month of February and Minimum of 24 mg/l in September during the period of investigation .Sulphur deficiency can inhibit algal growth indirectly by hindering chlorophyll synthesis (Cole, 1979)[25]. (Table-1, Figure-13).

n. Phosphates: Phosphates were recorded very low concentration in Medchal Lake and the concentrations are influenced by domestic sewage, agricultural drainage, and the release of laundry detergents into the aquatic system. The phosphate – phosphorus was recorded in range of 0.37 to 0.98 mg/l in April of observation noticed. (Table-1, Figure-14).

o. Nitrates: The estimated maximum amount of nitrates 1.15 mg/l in June and minimum amount 0.64 mg/l were recorded in March. (Table-1, Figure-15). Nitrogen is 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].

p. Silicates: This is an important parameter in fresh water ecosystem which regulates the diatoms population. Silicates are play an important role in the production of algal growth is well recognized. In the present investigation value ranged 1.92 mg/l in april to 2.99 mg/l. in june were recorded. (Table-1, Figure-16).

q. Organic matter: The highest value 2.5 mg/l was recorded in September and lowest value was recorded of 0.4 mg/l in August (Table-1, Figure-17). Organic matter infusion into the lake as outside the basin water inflowing.

r. Nitrites: Nitrites are increase with nitrogen rich flood water into the Lake .The maximum value 0.08 mg/l in july and the lowest value was 0.02 mg/l in march were recorded (Table-1, Figure-18). The lowest amount nitrite was recorded during the summer and monsoon may due to the utilization by eutrophication.(Abdar.,2013[27], Srinivas,M., 2018)[28].

Table 1. Monthly variation of Physico-chemical parameters

Parameters	JAN 2019	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC 2019	AVG.
Temp(°C)	22.4	27.1	30.1	31.14	31.13	29.2	24.2	23.2	22.9	22.4	21.6	21.7	25.58
pH	7.8	8.0	8.0	8.2	8.5	8.3	8.4	8.1	7.2	7.4	7.4	7.9	7.91
Carbonates (mg/l)	51.62	34.25	46.31	36.28	52.94	26.64	39.34	48.40	42.68	41.56	47.26	27.44	41.22
Bicarbonates(mg/l)	234.24	241.26	229.76	239.56	249.24	248.65	249.79	250.64	232.68	140.56	226.34	248.61	232.58
DO(mg/l)	8.2	6.9	4.3	4.4	4.5	5.2	5.6	5.8	6.4	7.2	8.4	8.3	6.26
BOD	8	6	8	10	8	8	4	4	5	10	8	10	7.41
COD(mg/l)	19	28	24	31	29	27	10	10	12	14	16	16	19.66
TH(mg/l)	222	245	260	188	196	178	182	120	194	180	194	218	198.08

Calcium(mg/l)	35.26	38.28	44.29	46.96	49.92	41.34	44.66	60.49	46.74	42.12	51.39	54.58	46.33
Magnesium(mg/l)	35.79	28.84	34.68	40.24	38.66	28.24	30.66	26.78	34.42	29.94	26.64	24.78	31.63
TDS(mg/l)	320	360	410	495	395	330	340	310	360	340	330	320	359.16
Chlorides(mg/l)	127.26	165.28	122.6	198.96	145.56	126.25	158.56	148.64	140.67	160.54	140.68	190.58	152.13
Sulphates(mg/l)	32	36	30	34	30	34	32	36	24	28	26	36	28.75
Phosphates (mg/l)	0.88	0.66	0.53	0.98	0.44	0.56	0.42	0.77	0.76	0.64	0.89	0.67	0.68
Nitrates(mg/l)	0.87	0.85	0.64	0.66	0.98	1.15	1.08	0.98	0.97	0.67	0.74	0.95	0.87
Silicates(mg/l)	2.24	2.44	2.16	1.92	2.75	2.99	1.93	1.94	2.18	1.96	2.56	1.96	2.25
Organic matter(mg/l)	1.8	0.9	1.4	1.8	1.8	0.6	0.5	0.4	2	1.9	1.6	1.8	1.37
Nitrite(mg/l)	0.04	0.06	0.02	0.06	0.03	0.04	0.08	0.02	0.04	0.04	0.02	0.05	0.04

Figure-1:- Showing variation in temperature.

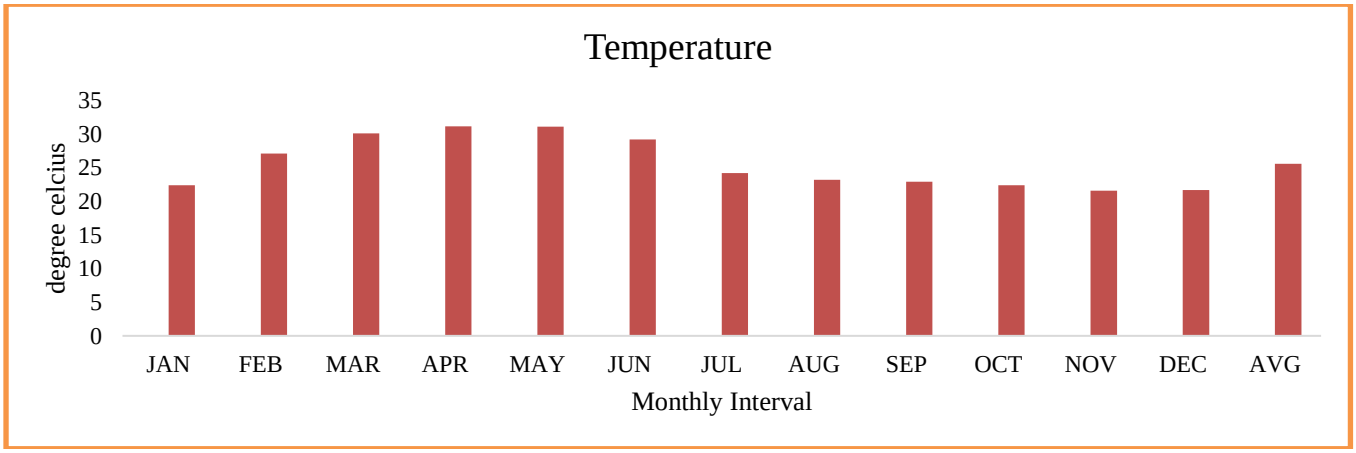


Figure-2:- Showing variation of pH

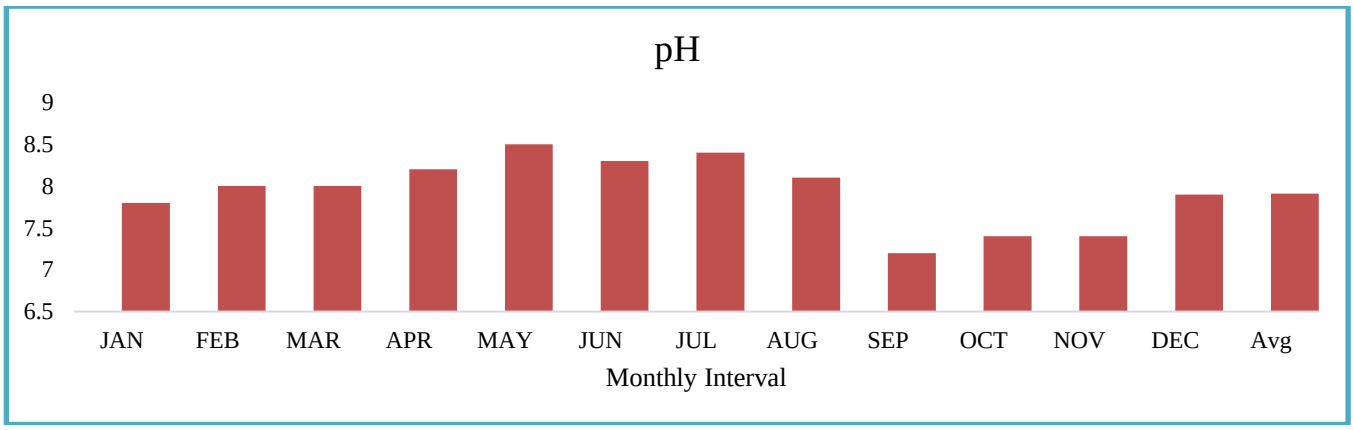


Figure-3:- Showing Amount of Carbonates

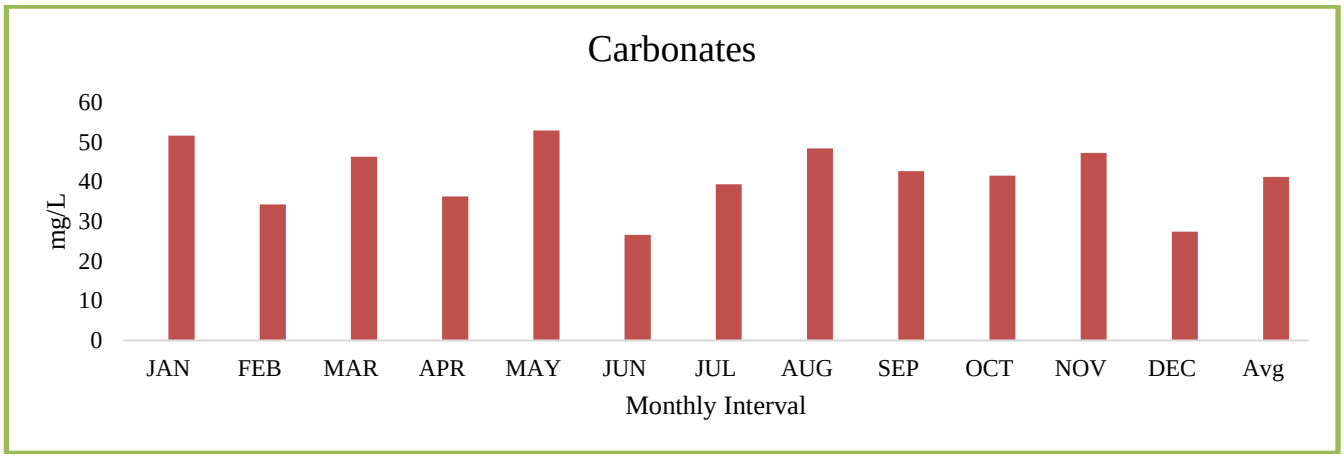


Figure-4:- Showing Amount of Bicarbonates

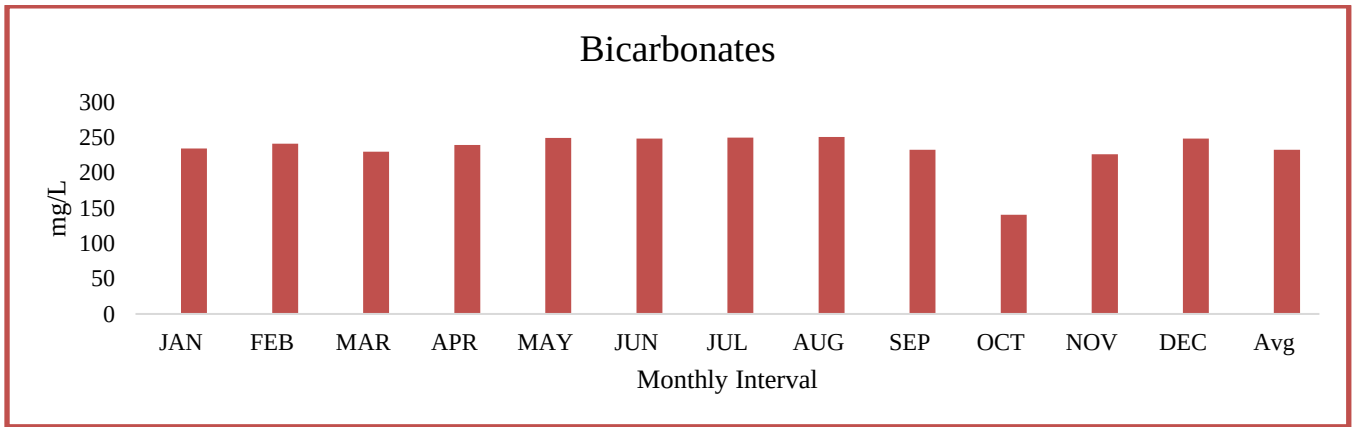


Figure-5:- Showing variations in Dissolved Oxygen

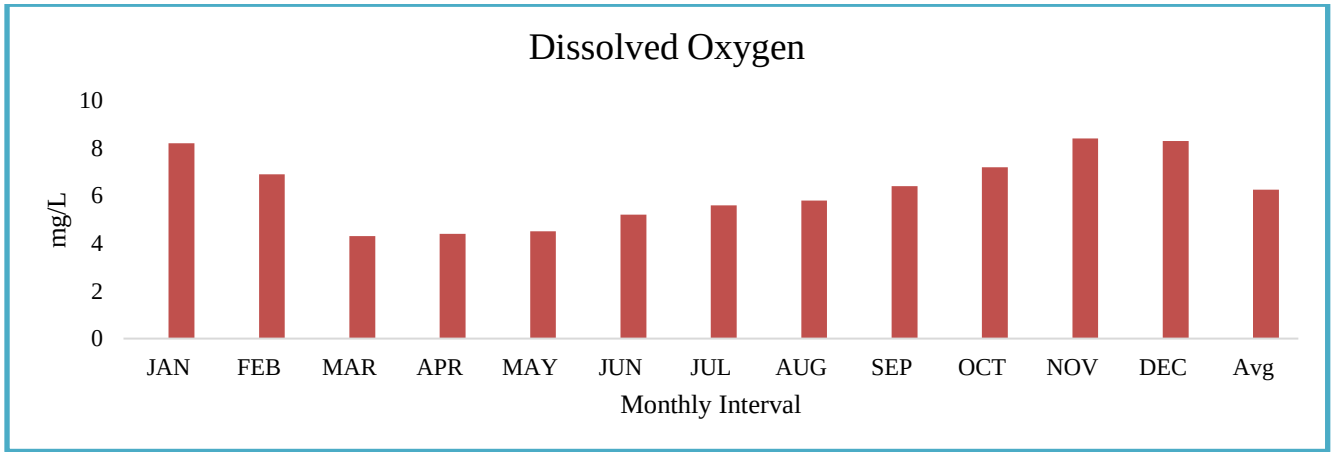


Figure-6:- Showing variation of Biological Oxygen Demand

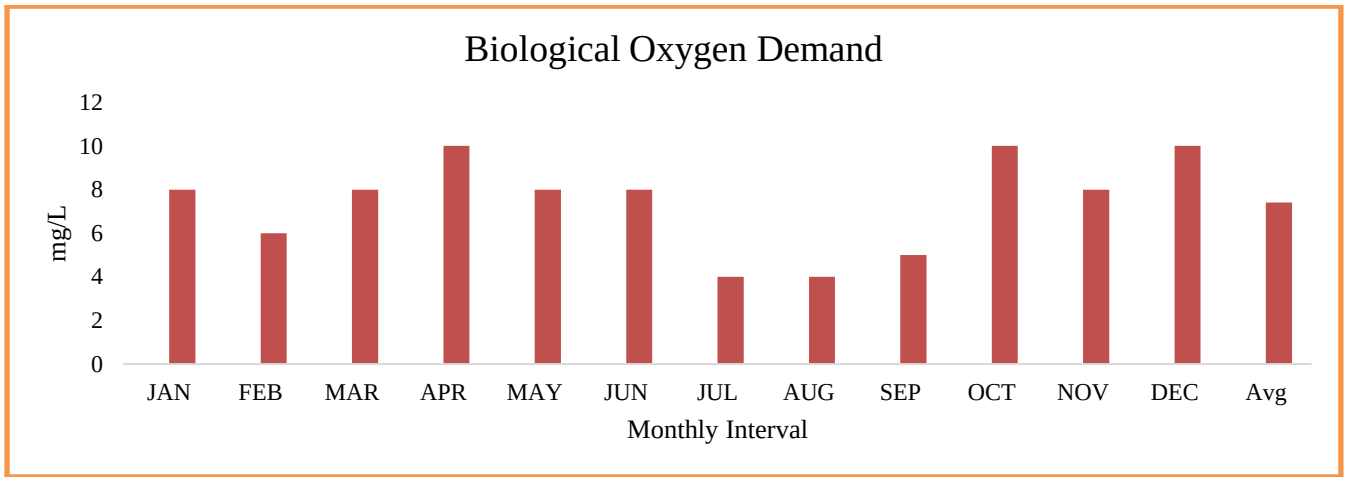


Figure-7:- Showing variation of Chemical Oxygen Demand

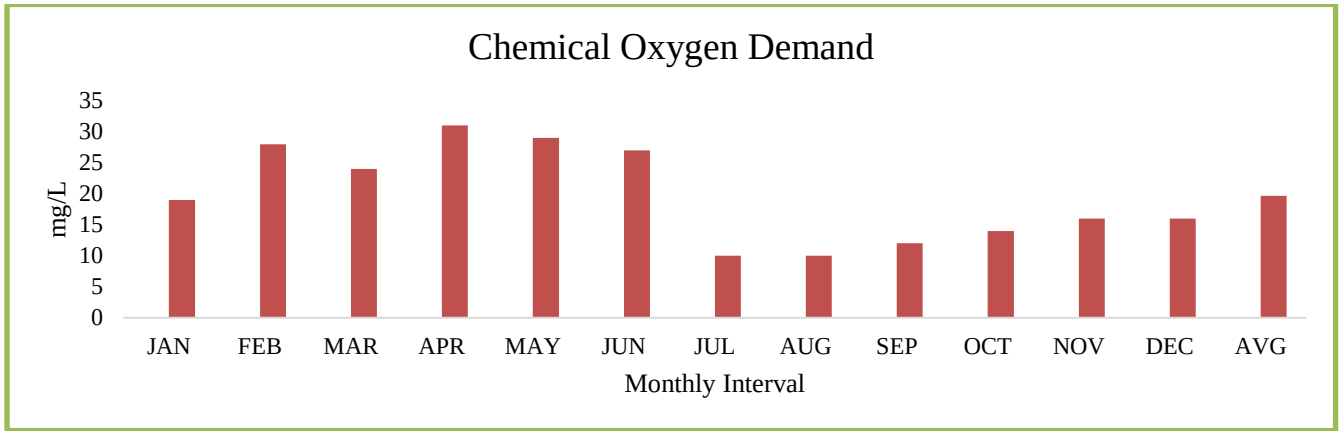


Figure-8:- Showing variation in Total Hardness

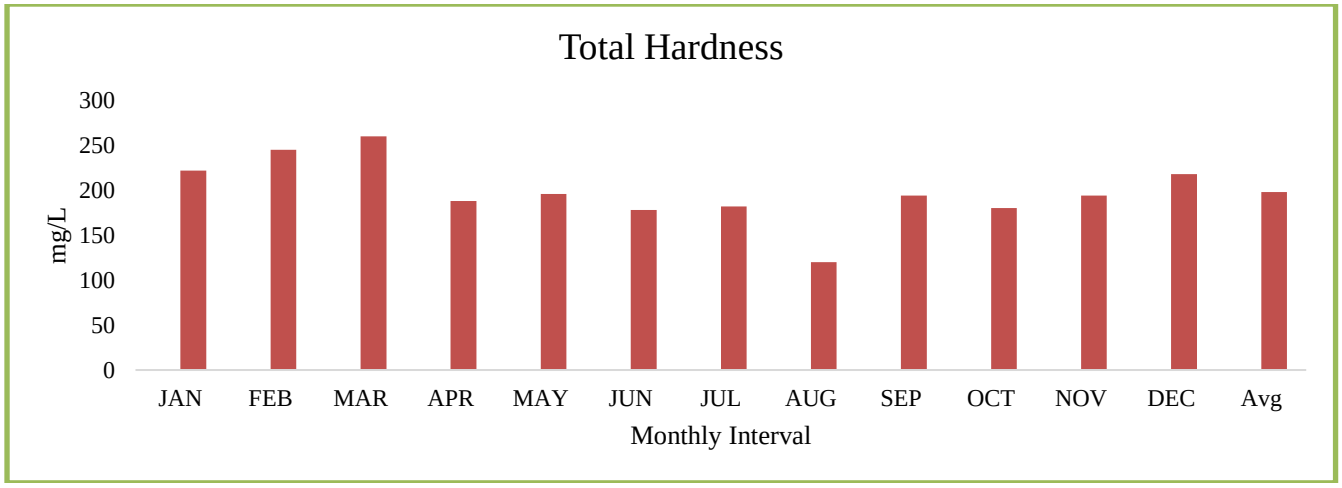


Figure-9:- Showing Amount of Calcium

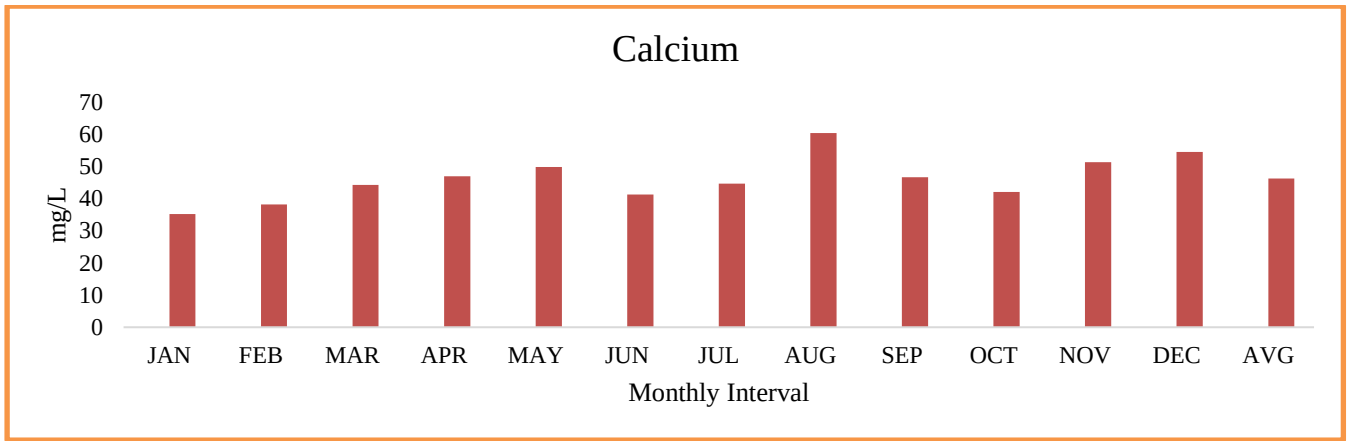


Figure-10:- Showing Amount of Magnesium

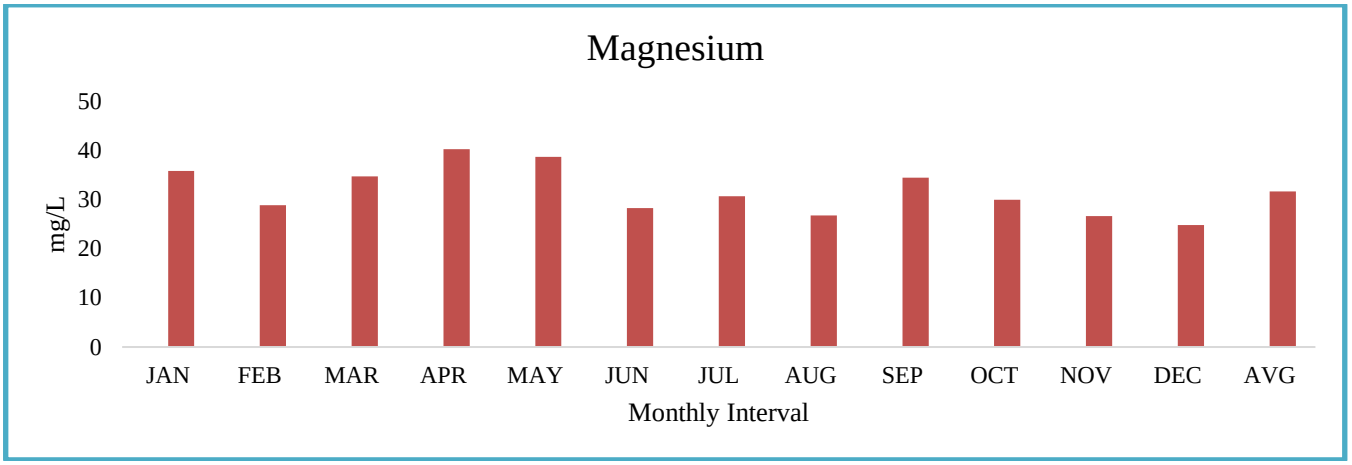


Figure-11:- Showing variation of Total Dissolved Solids

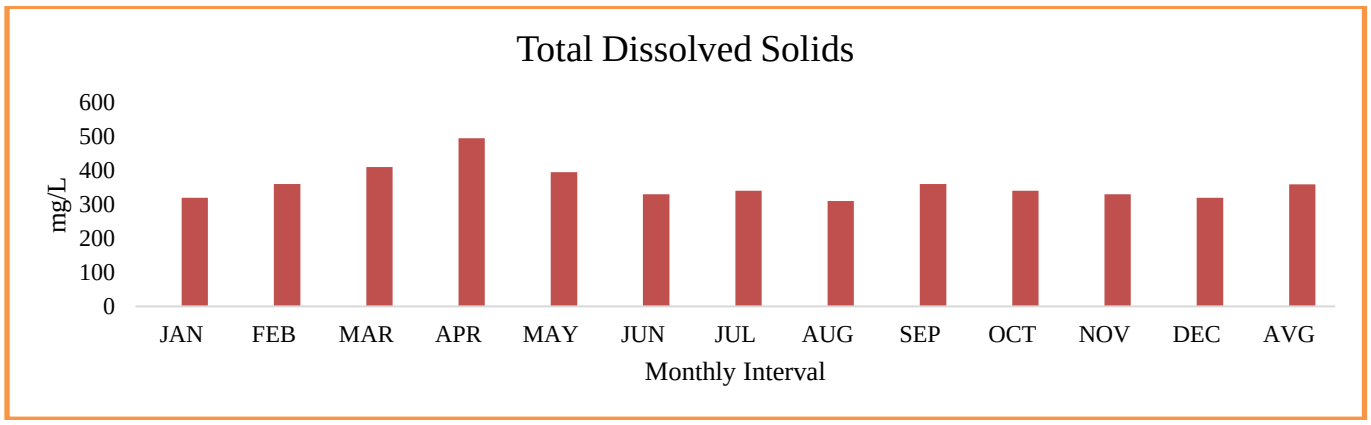


Figure-12:- Showing Amount of Chlorides

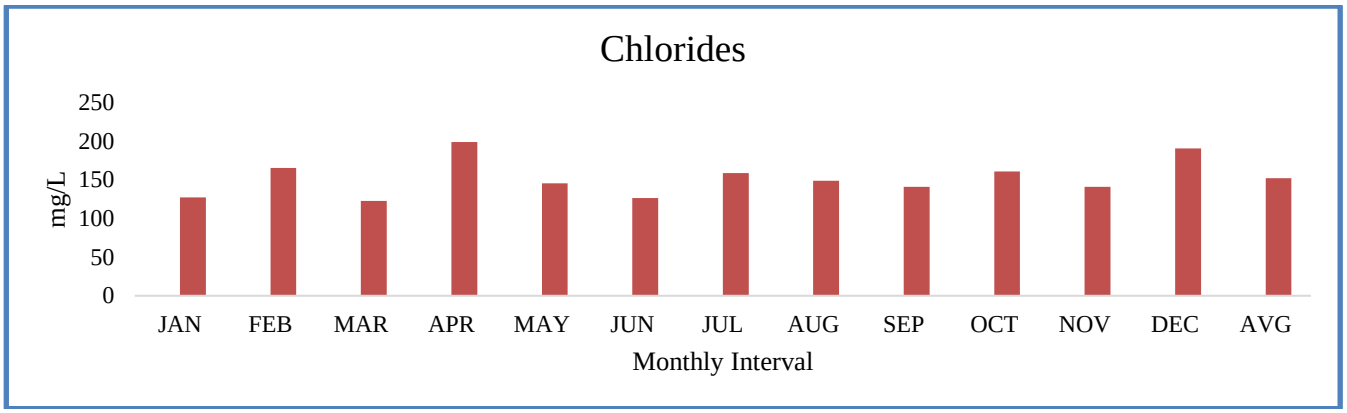


Figure-13:- Showing Amount of Sulphates

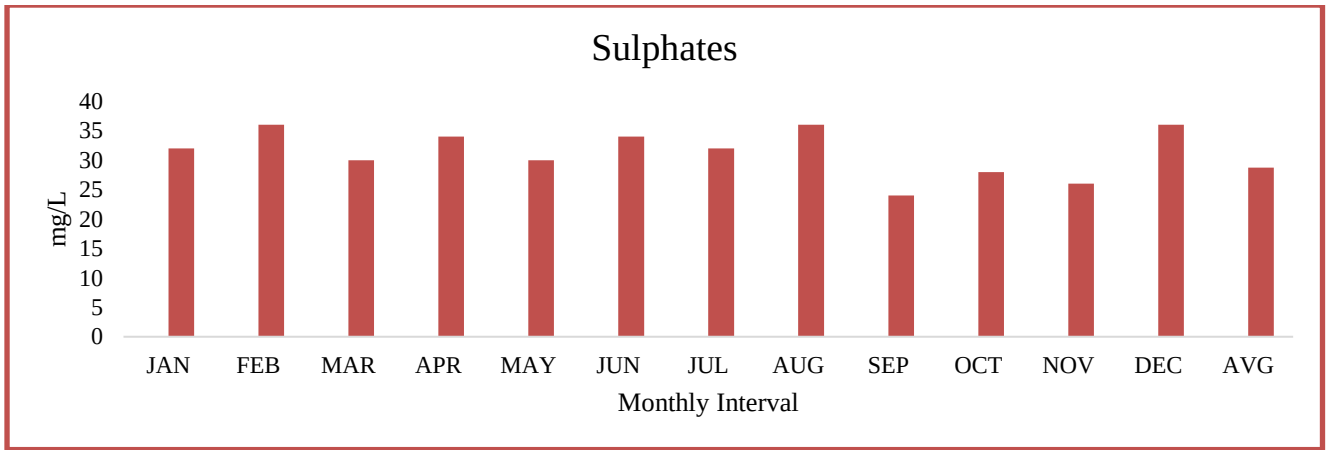


Figure-14:- Showing Amount of Phosphates.

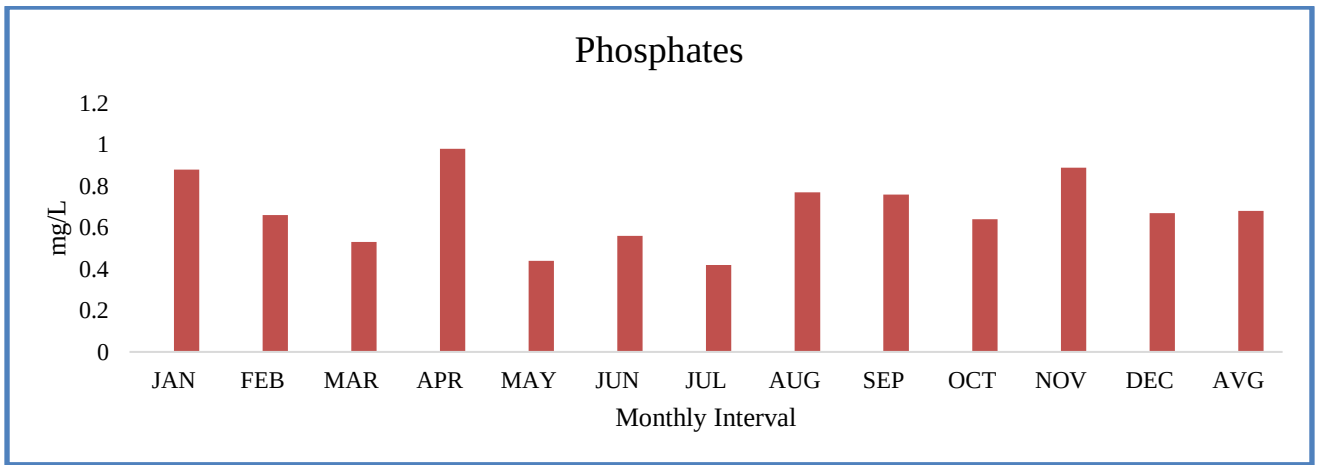


Figure-15:- Showing Amount of Nitrates

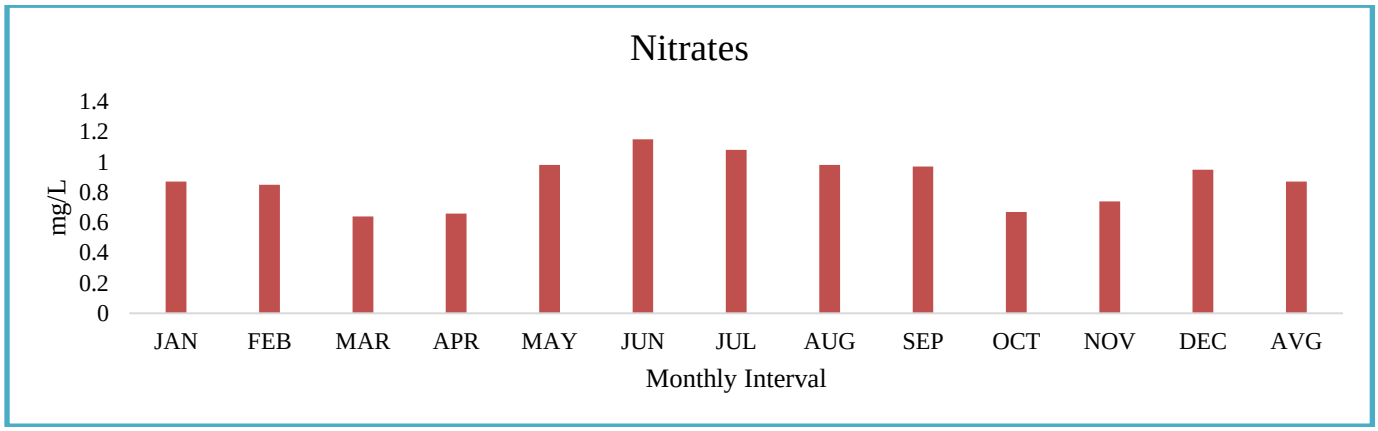


Figure-16:- Showing variation of Silicates

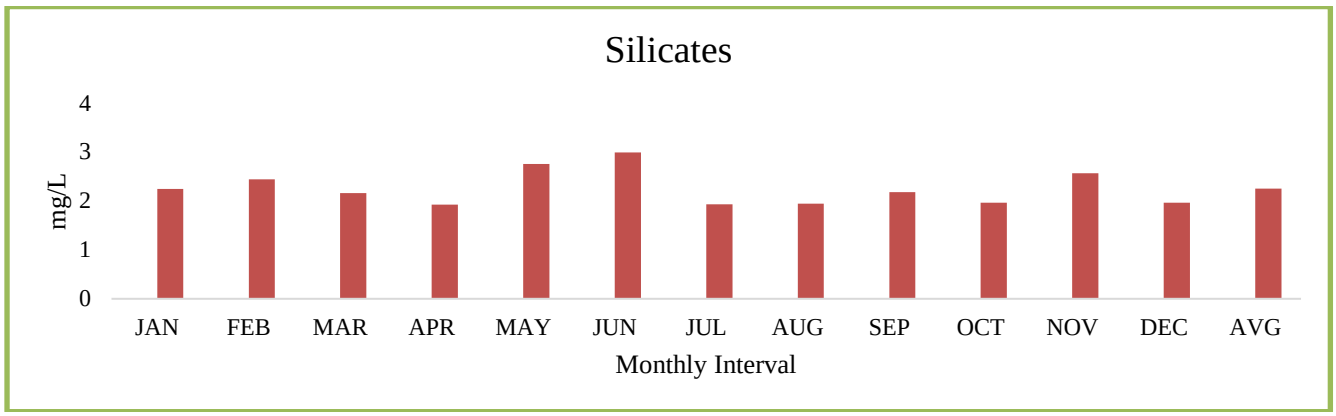


Figure-17:- Showing Content of Organic Matter

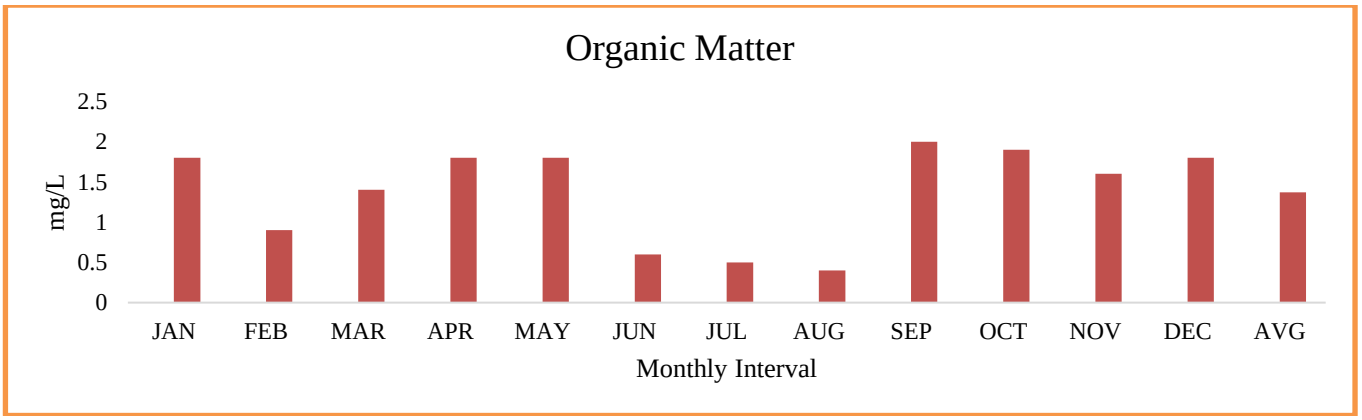
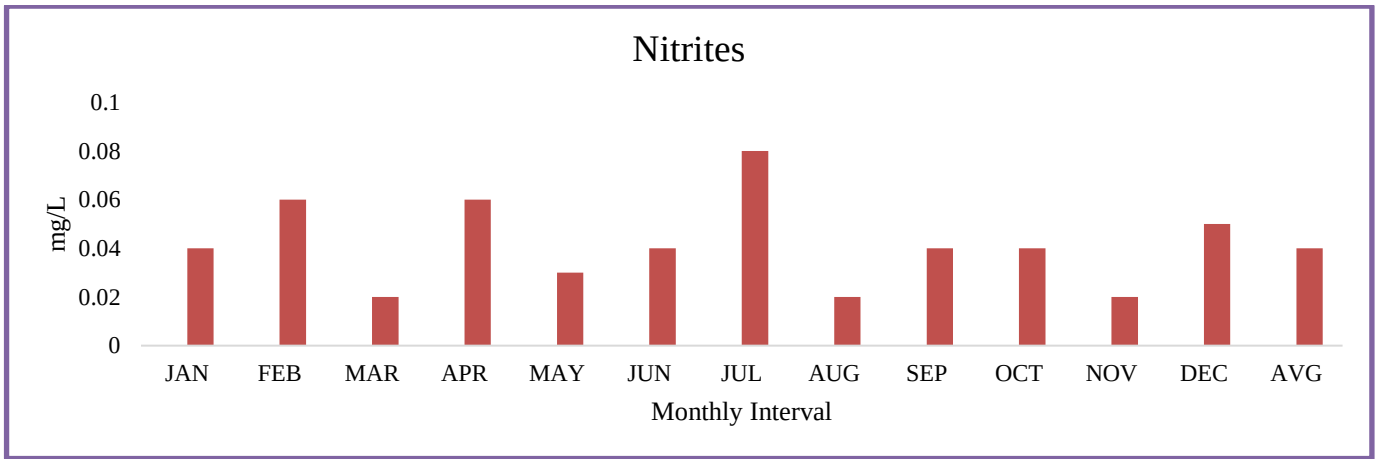


Figure-18:- Showing Amount of Nitrites



IV. CONCLUSION

In the present investigation the resultant of analysis of Physico –chemical parameters had indicated that human activity and influx of domestic waste into the lake led to eutrophication. The values of physico – chemical parameters assessed were found to be within or slightly above the permissible limit prescribed by WHO. Physico chemical analysis of water of Lake has indicated a continuous change in its trophic state, which correlates temporally with an increase in anthropogenic activities.

V. ACKNOWLEDGEMENT

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