Research Paper

Water Quality Parameters of Mansagar Lake Jaipur, Rajasthan

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ABSTRACT
The present research work was carried out for assessing the physicochemical parameters ofMansagar lake Water. Water samples were collected continuously over 12 months from January to December 2022 in triplets from designated locations inside the lake. The sampling and testing process was kept strictly according to the procedures of IS and APHA standards.The physico-chemical parameters observed were then compared to the allowable limits in accordance with the standards of the National Plan for Conservation of Aquatic Ecosystem (NPCA), which is run by the Indian government's Ministry of Environment, Forests, and Climate Change. It was discovered that while certain parameters were within the range, others were over the allowable limits.
It certainly indicates that the lake is getting polluted day by day and the possible reasons may be continuous growth of population resulting into rapid industrializationand disposal of waste in the water body.
Key words: *JalMahal, Water Pollution, Physico-Chemical Parameters, Dissolved oxygen*

I. Introduction
Lakes are one of the best places to store water, which is a necessity for life. MansagarLake is an example of a manmade lake located in northern Jaipur. This lake was built by Maharaja Mansingh of Amer "The king of that Era" in 1610. JalMahal, a monument, was built in the lake. The sole notable body of water in the city of Jaipur is this lake, which is also one of the most popular tourist destinations. It is surrounded on three sides by the Aravalli Hills, and on the fourth side are plains that are today heavily populated. Mansagar Lake's water spread area is around 300 acres, or 121 hectares. Numerous migrating bird species find refuge in the Mansagar Lake, which also offers aquatic species a sustainable place to live. Due to silt deposits on the lake bed, the bed depth has decreased recently, causing the lake to expand its water spread area. The inflow of partially treated and untreated wastewater from Nagtalai and the Brahmpuri Sewage Treatment Plant is causing the lake to become more and more contaminated every day.

II. Literature Review
Several research works have been carried out on the water quality of different lakes as well as MansagarLake of Jaipur.(chaudhary, 2021) (Mishra Amarnath, 2020) (Singh, 2022) (Liu Yang, 2007) (Karim Loucif, 2008) (Singh, 2022) (Prachi Vasistha, 2020)
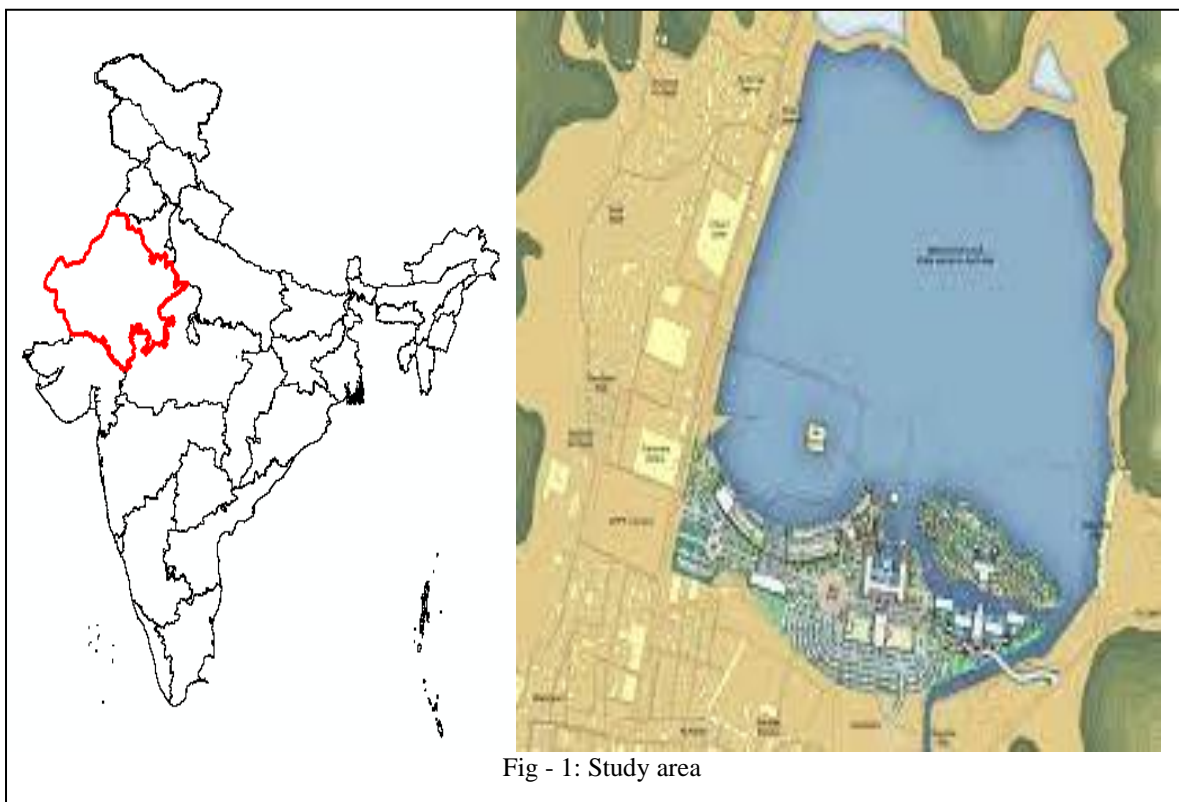

III. Methodology

Study area

Fig - 1: Study area

Collection of Samples -Some designated locations within the lake were used to gather the samples. The samples were collected in high grade plastic bottles.

Analysed parameters:

Electrical conductivity (EC), Temperature, pH, Total dissolved solids (TDS), Dissolved Oxygen (DO), Total hardness(TH), Calcium hardness; Turbidity, Acidity, Alkalinity, Biological oxygen demand (BOD) and Chemical oxygen demand (COD) were the parameters that were analyzed from the lake water samples.

Analysis method

The pH and EC were measured by using portable meters. The concentration of magnesium, calcium, hardness, nitrate and salinity was estimated by volumetric methods and the results are compared with BIS standards.

Table 1 and Table 2 below shows the protocols followed for the testing of different parameters andtheir permissible limits.

Sl. No.	Parameter	Method
1	Acidity	APHA (21st Ed.) Method
2	Alkalinity	IS 3025 (Part 23): 2019
3	BOD (3 Day @ 270 C)	IS 3025 (Part 44): 2019
4	Calcium Hardness	IS 3025 (Part 40): 2019
5	Cd	IS 3025 (Part 65): 2017
6	Chloride (as Cl)	IS 3025 (Part 32): 2019
7	COD	IS 3025 (Part 58): 2017
8	Dissolved Oxygen	IS 3025 (Part 38): 2019
9	Fluoride (as F)	IS 3025 (Part 60): 2019
10	Magnesium Hardness	IS 3025 (Part 46): 2019
11	Nitrate (as NO3)	IS 3025 (Part 34): 2019
12	Pb	IS 3025 (Part 65): 2017
13	pH	IS 3025 (Part 11): 2017
14	Temperature	In-house Method
15	Total Dissolved Solids	IS 3025 (Part 16): 2017
16	Total Hardness (as CaCO3)	IS 3025 (Part 21): 2019
17	Turbidity	IS 3025 (Part 10): 2017
18	Zn	IS 3025 (Part 65): 2017

Table 1: Protocols followed

Physicochemical parameters	Permissible values
Bicarbonate (mg/L)	200
Calcium (mg/L)	75
Chloride (mg/L)	250
Fluoride (mg/L)	1
Magnesium (mg/L)	30
Nitrate (mg/L)	45
pH	7.2
Sulphate (mg/L)	200
Total dissolved solids (mg/L)	500
Total Hardness (as $CaCo_3$) (mg/L)	200

**Table 2: Desirable and permissible limits of parameters**

Duration of study

Water sampling was done during February 2022 to December 2022. A thorough analysis of the physico-chemical parameters was designed and carried out based on 12 months of testing and sampling Procedures. The IS and APHA guidelines were followed in the sampling and testing of the lake water. Table 3 shows

Parameters	Sample 1	Sample 2	Sample 3	Sample 4
pH	7.71	7.82	7.75	8.52
EC(us/cm)	1840	1860	1610	1643
Turbidity(NTU)	21	16.0	9.2	8.5
COD(mg/l)	100	80.0	85	100
BOD(mg/l)	19.0	15.0	18	19
DO(mg/l)	6.8	6.6	6.5	6.6
TSS(mg/l)	24.0	19.0	22.0	23
TDS(mg/l)	952	968	969	954
TH(mg/l)	316.80	316.80	318.9	318.80
Na(mg/l)	174.25	173.55	177.66	176.80
K(mg/l)	22.20	22.05	22.06	22.05
Mg(mg/l)	52.27	57.02	55.02	56.0

Table 3-Physico-chemical parameters of lake water during January 2022-december 2022

For better understanding the monthly variations in physicochemical parameters are shown through the graphs below. The graph 1 shows the variation in pH values of lake water.It is evident that the ph value is maximum in the month of May, June and November.In rest of the months the pH value is within the permissible limits. Graph 3, 4 and 5 shows the monthly variations in COD and BOD and DO levels which again are very important parameters as far as water quality is concerned. It can be seen that the BOD levels are high and the DO level is very low during the month of August. During this study it was also observed that the BOD level was much higher than the permissible limit in all the months. Thevariation in other parameters is shown in Graphs 6 to 10 below and we can observe the undulating values throughout the year. The present analysis clearly indicates that the lake water is not meeting the desirable criteria of clean water and is polluted. It is important to first treat this water before any kind of usage. The COD values are also above permissible limits in the lake water which shows presence of industrial effluents in lake water.
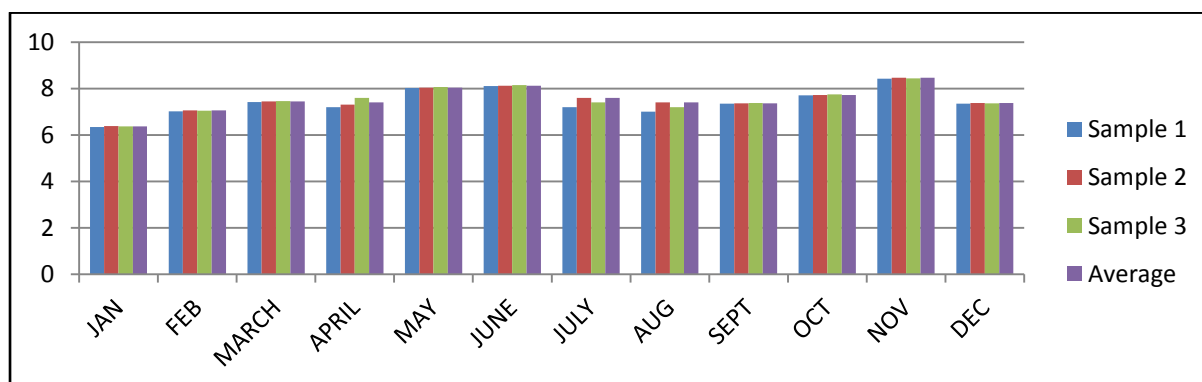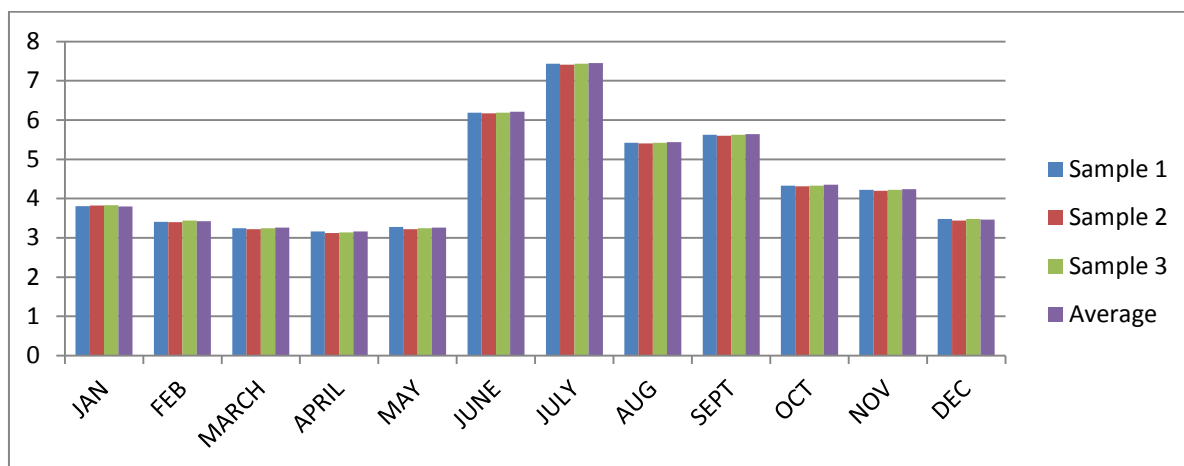

Graph 1 - Variation in pH of lake water during study period
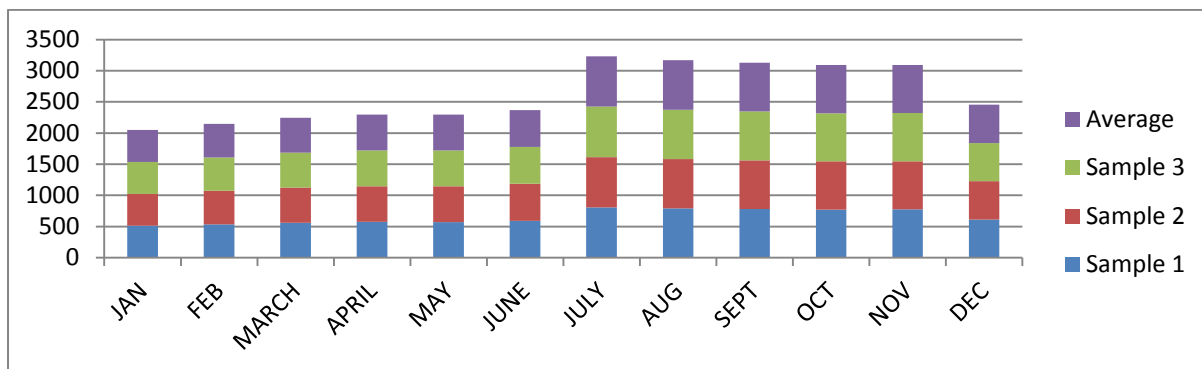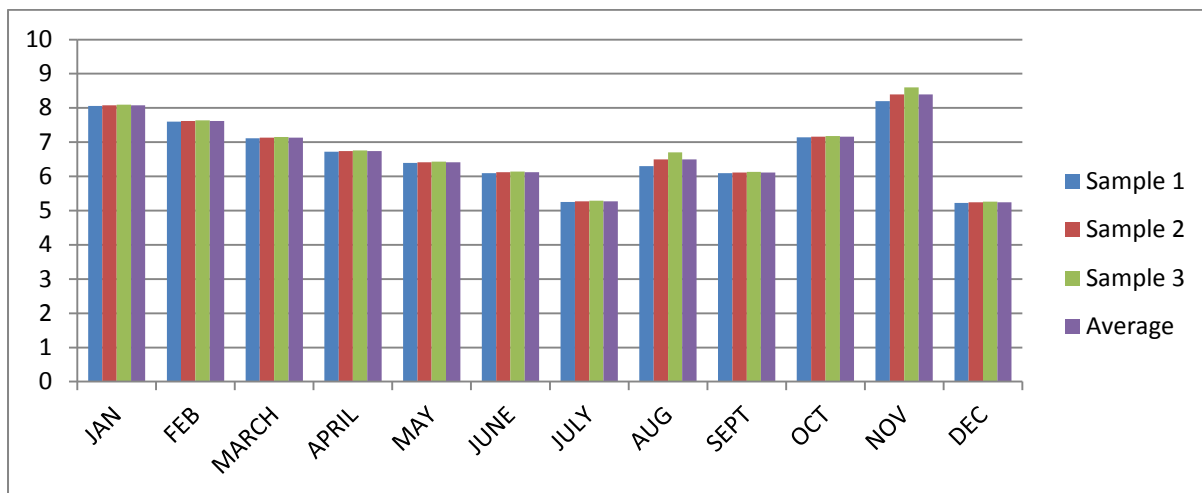
Graph 2 - Variation in EC of lake water during study period
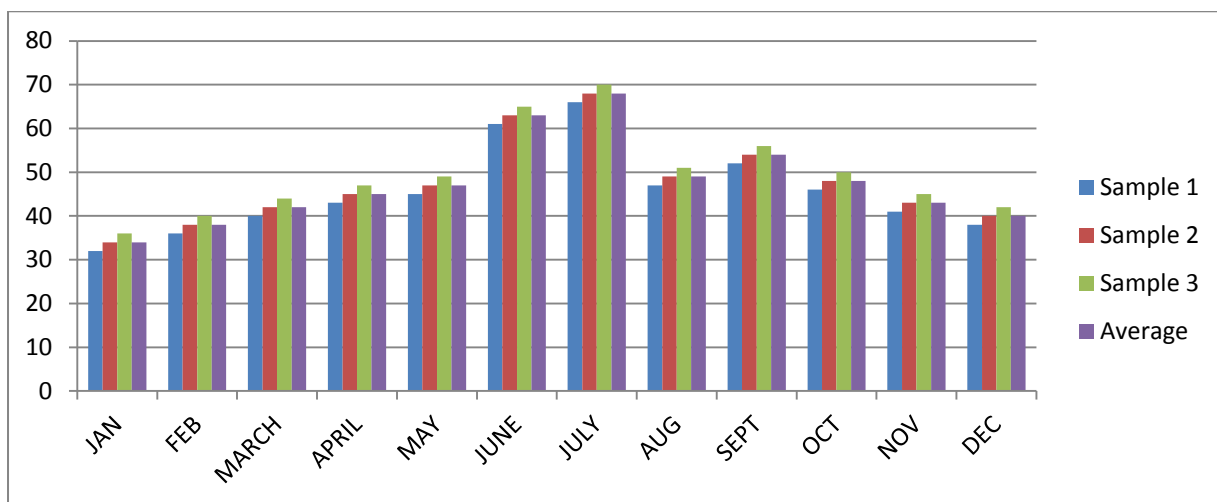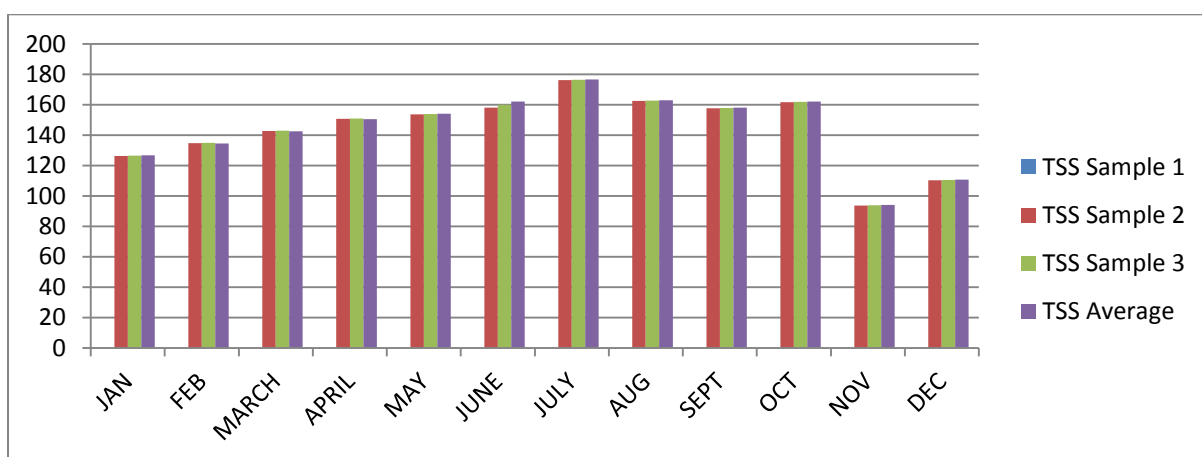

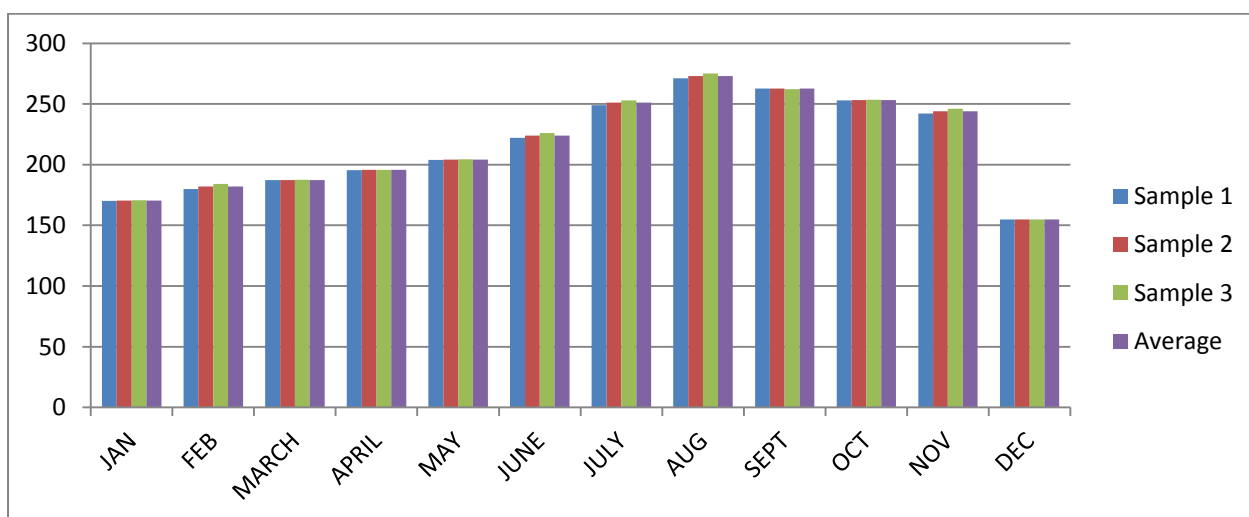Graph 3 - Variation in COD of lake water during study period

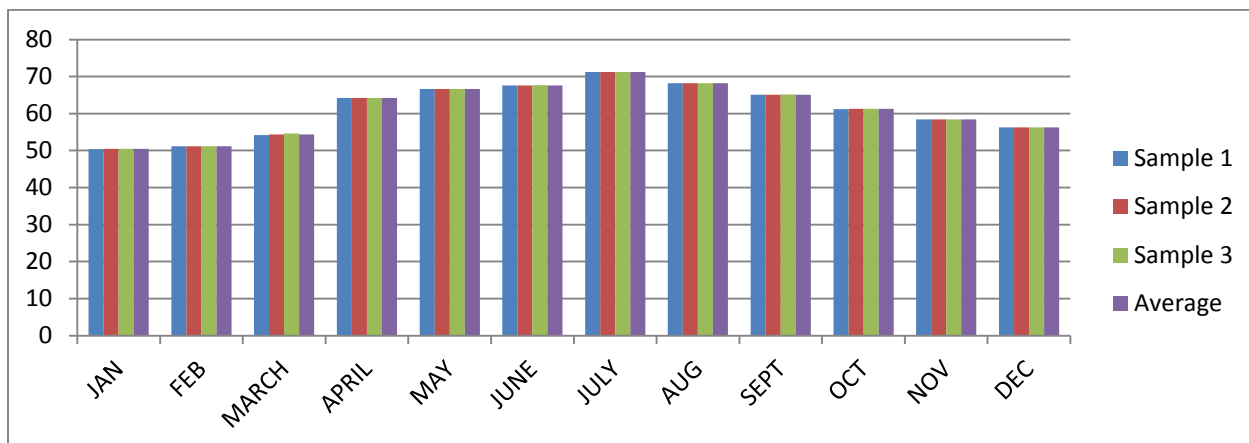Graph 4 - Variation in BOD of lake water during study period

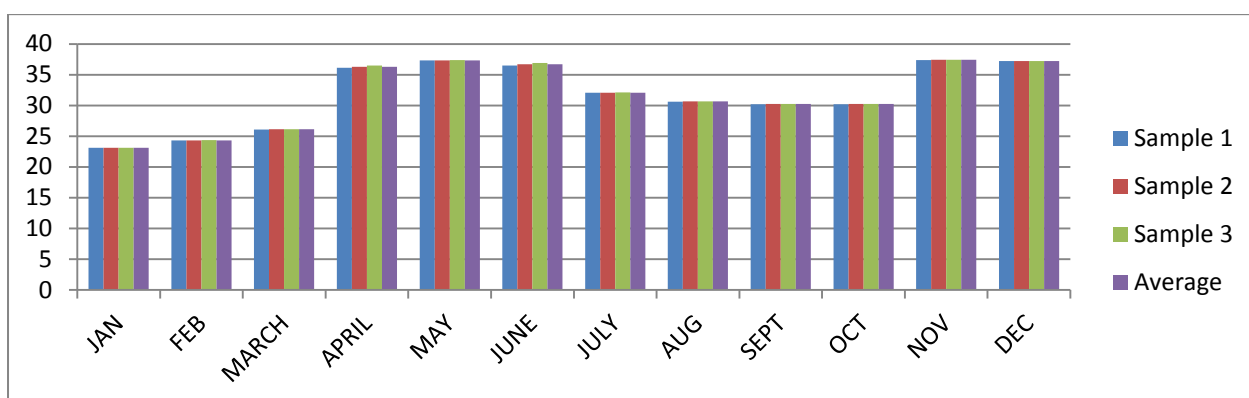Graph 5 - Variation in DO of lake water during study period

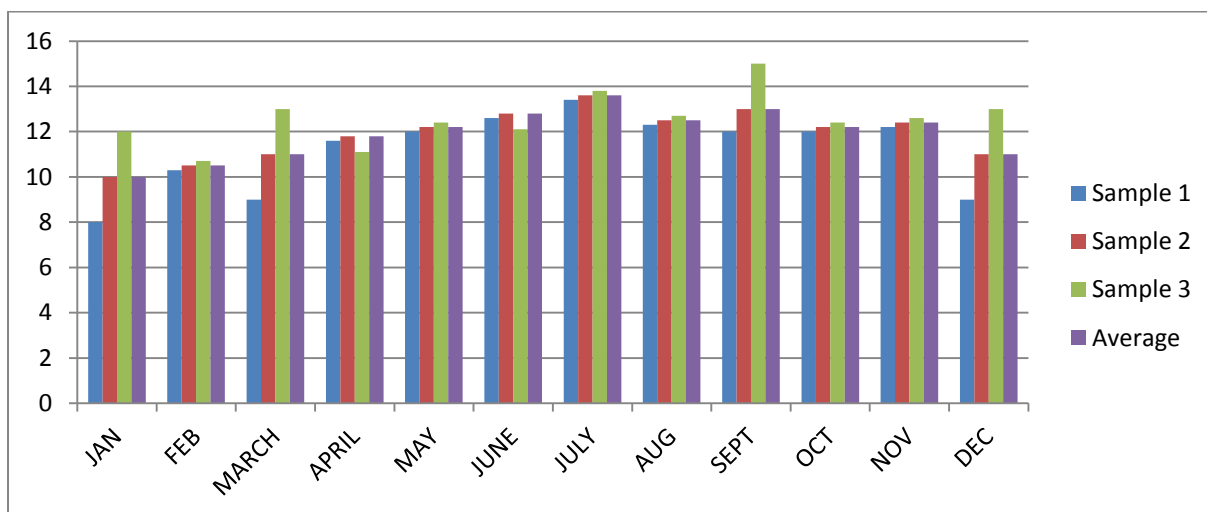Graph 6 -Variation in TSS of lake water during study period

Graph 7- Variation in TH of lake water during study period

Graph 8- Variation in Cahardessof lake water during study period

Graph 9- Variation in Mg hardnessof lake water during study period

Graph 10- Variation in Nitrate (No^3)of lake water during study period

IV.   Conclusion

Through a comparison of the evaluated lake water parameters with the NPCA requirements, it is evident that the pH level of MansagarLake which is in the range of 7.71 to 8.52 is moderately suitable. Whereas dissolved oxygen has been shown suitable for usage in categories B, C, and D of water, with a range of 3.6 – 5.8 mg/L.

According to the NPCA criteria, BOD which is in the range of 15.0 to 19.2 is not appropriate for any category. In summary, this means that, in accordance with NPCA standards the quality of lake water is currently unsuitable for any kind of uses.

Future scope of research

　　　　Present analysis is a part of assessment of physicochemical parameters and heavy metals analysis and its accumulation in the aquatic flora and fauna. It will give insight to further research.

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