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STUDY OF SEASONAL VARIATION OF KARANJI LAKE WATER OF MYSORE CITY, INDIA

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Abstract

Since it is a universal solvent, water has the power to dissolve both organic and inorganic materials. The component of water that is present at the ideal level for healthy plant and animal growth is often referred to as the water's quality. The growth of living organisms in the body of water is influenced by several significant elements, including temperature, turbidity, nutrients, hardness, alkalinity, dissolved oxygen, etc. An environmental danger is created when domestic waste is dumped straight into the water of the Karanji lake in the Mysore, India. Water samples were taken every month and analysed for a variety of physical and chemical characteristics, including temperature, pH, electric conductivity, turbidity, alkalinity, dissolved oxygen, etc., to better understand the condition. Statistics were compared to standard values established by W.H.O. guidelines (1998), which showed that the water content had excessive levels of turbidity, total dissolved solids, pH, hardness, alkalinity, and phosphate. The buildup of these pollutants poses a grave threat to aquatic and terrestrial life.

Keywords: Alkalinity**,** pH, Total dissolved solids, awareness, environment.

Introduction

Water is one of the most significant and common elements of the environment. Every living thing on Earth depends on water for survival and development. The percentage of water on Earth is still only 70%. However, the environment is highly polluted because of the increase in human population, industrialization, the use of fertilizers in agriculture, and other human-made activities [1]. In river water with high levels of pollutants, especially organic waste, total dissolved solids (TDS), total suspended solids (TSS), biological oxygen demand (BOD), and chemical oxygen demand (COD) all increase. (TSS). They contaminate water, making it unsafe for drinking, irrigating crops, or any other use [2].

The quality of ground water is determined by the concentration and quality of several chemical components, many of which are generated from the geological data of the area. Industrial and municipal solid waste are major sources of contamination of surface and ground water. Industrial waste is usually dumped into waterways in urban areas of developing countries. The physical and chemical limnology of a reservoir, which includes all physical, chemical, and biological components of water that influence the usage of the water for good, establishes the quality of the water. For irrigation, fish farming, drinking water supply, recreation, and other purposes where water must have been impounded, water quality is essential [3].

MATERIALS AND METHODS

Water samples from the Karanji Lake were collected as per standard procedures. The various Physico - chemical parameters were studied using standard methods [11]. The results obtained were analysed and compared with the WHO and ISI standards [12] listed in table 1. Temperature of the water samples was recorded at the sampling point. AR grade chemicals and glass distilled water was used for the preparation of the reagents. Electrical Conductivity and pH were determined using Systronics - Conductometer and Digital Systronics pH – meter respectively. The water quality parameters like Alkalinity, Total dissolved solids, Calcium and Magnesium ions, pH, Electrical Conductivity, Total, Temporary and Permanent hardness, etc. were studied.

Collection of samples

The water samples were collected in the polyethylene bottles. Initially, the prewashed bottles were rinsed with sample water. The closed bottle was dipped in the lake at the depth of 0.5 m, and thena bottle was opened inside and was closed again to bring it out at the surface. The samples collected in three replicates from five different points were mixed to prepare an integrated sample.

Results and Discussion

The physico-chemical characteristics of water samples taken from Karanji lake in Mysore, Gujarat, India were examined. These characteristics included temperature, pH, electric conductivity, turbidity, alkalinity, dissolved oxygen, total dissolved solids, calcium, magnesium, sodium, chloride, and phosphate. At each of the lake's five sites, these parameters were periodically measured.

Temperature

The physico-chemical and biological properties of water are controlled by temperature, which is one of the most significant elements in the aquatic environment, especially in freshwater [8]. The greatest temperature in the summer was 29°C, which can be attributed to strong solar radiation, low water levels, a clear sky, and a warm atmosphere [9]. Due to the extremely low ambient temperature and shorter photoperiod, the lowest temperature recorded during the winter season was 20°C [10].

Electrical Conductivity

Electrical conductivity, a measure of a substance's ability to carry an electric current, has been used to determine the purity of water [11]. The summertime electrical conductivity record was 3.64 / cm, while the wintertime record was 3.18 /cm. A high conductivity value during the summertime suggests both the trophic levels and pollution state of the aquatic body [12].

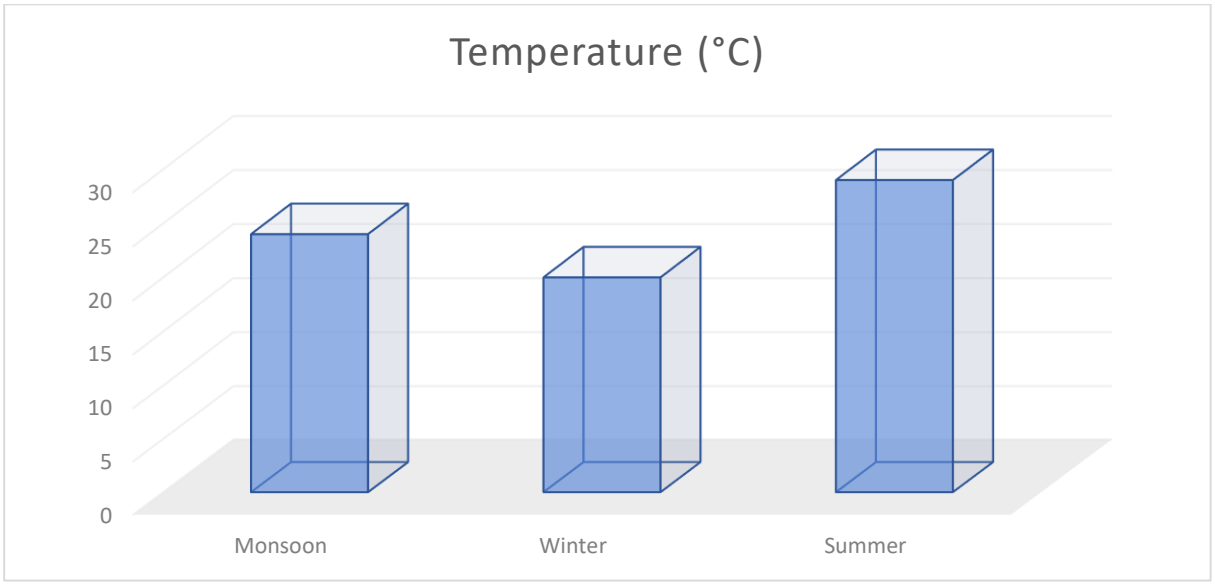
Turbidity

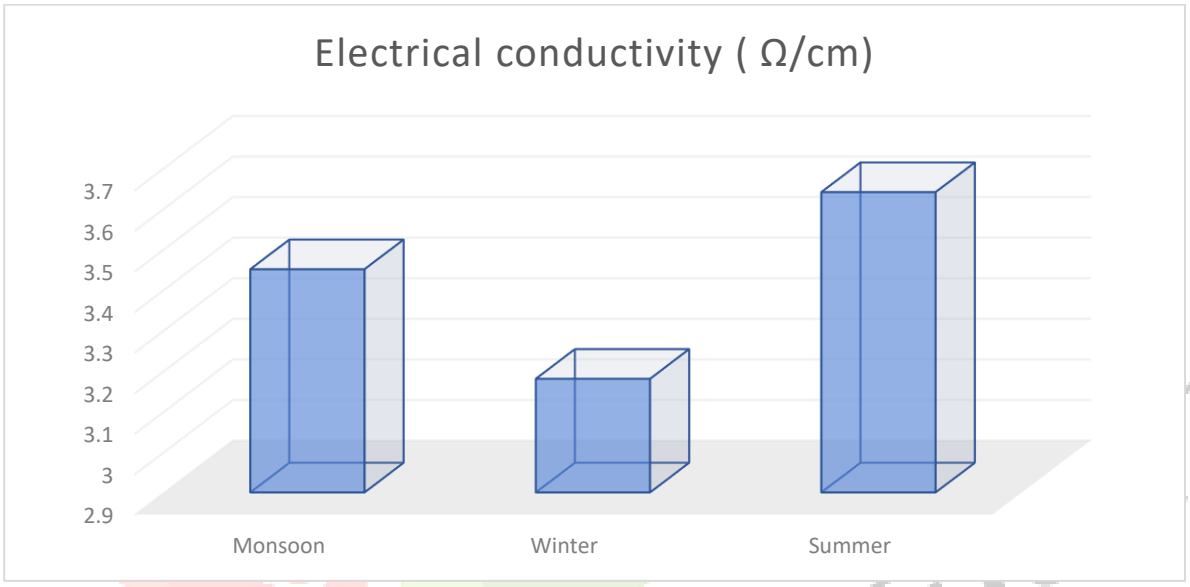
The intensity of light dispersed by the water's particles is reflected by the turbidity of the water, which is related to the expression of an optical quality. Due to the increase of aquatic vegetation and decreased water flow, the high turbidity measurement recorded in the summer was 26 NTU [13]. Due to water dilution from monsoon showers and relatively little lake runoff, the lowest turbidity recorded during the monsoon was 19 NTU.

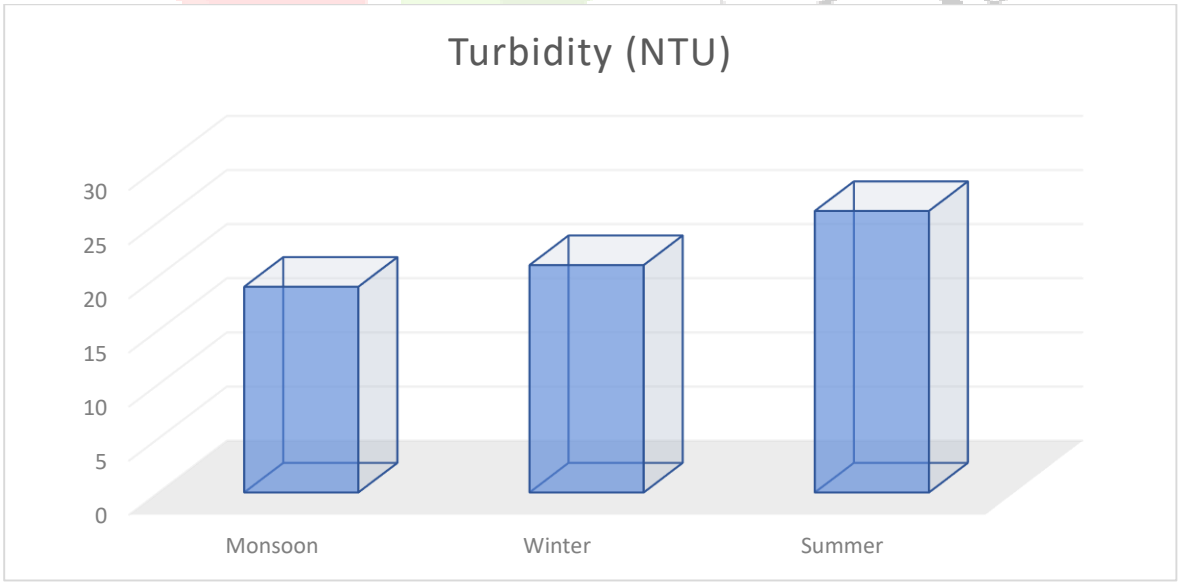
Total Dissolved Solids (TDS)

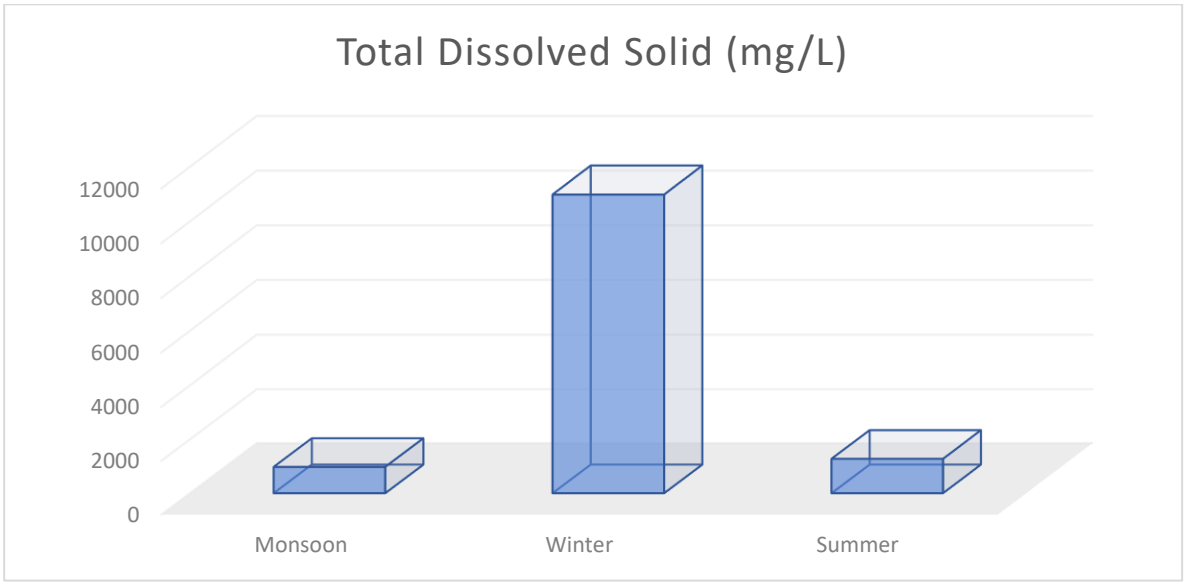
The addition of dead organic materials from the decomposition of aquatic plants and animals, which may be related to the water dilution produced by evaporation at high temperatures throughout the summer, resulted in the greatest total dissolved solids (TDS) being measured in the summer at 1276 mg/L. During the monsoon, rainwater may have reduced the TDS concentration to 976 mg/L (the lowest TDS recorded in the records). The W.H.O. recommends a TDS limit of 500 mg/L, indicating that the observed TDS represents the polluted environment. water from a lake. One of the causes of a rise in TDS measurement may be the pollution of surface water bodies with residential waste, trash, and other related wastes [8,9]. In this instance, our on-the-ground observations were comparable.

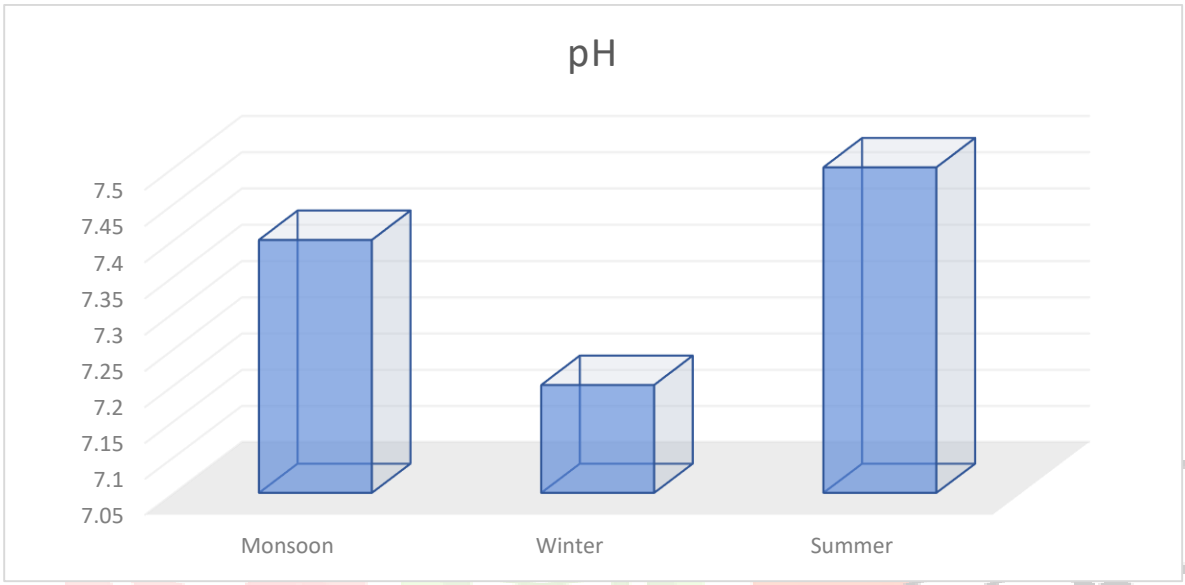
Average with standard error values of physico-chemical parameters of Karanji lake					
S. No.	**Parameters**	**Monsoon**	**Winter**	**Summer**	**W.H.O. standards for Drinkingwater**
1	Temperature (˚C)	24 ± 1.27	20 ± 1.2	29 ± 0.42	30-32
2	Electrical conductivity (Ω/cm)	3.45 ± 0.41	3.18 ± 0.15	3.64 ±0.84	500
3	Turbidity (NTU)	19 ± 0.63	21 ± .25	26 ± 0.75	5
4	Total Dissolved Solid (mg/L)	976 ± 32.47	10983±24.63	1276±22.6	259-500
5	pH	7.4 ± 0.13	7.2 ± 0.84	7.5 ± 0.34	6.5-8.5
6	Alkalinity (mg/L)	260 ± 6.47	210 ± 4.15	286 ± 2.32	100
7	Total hardness (mg/L)	280 ± 6.10	264 ± 4.16	242 ± 3.15	200
8	Calcium (mg/L)	48 ± 0.36	38 ± 1.54	32 ± 0.86	75
9	Magnesium (mg/L)	32 ± 0.54	36 ± 2.58	33 ± 5.41	150
10	Dissolved oxygen (mg/L)	4.81 ± 0.47	5.51 ± 0.88	3.50 ±1.63	7.5
11	Chloride (mg/L)	103 ± 4.1	98 ± 6.24	102 ± 4.63	200
12	Sodium (mg/L)	48 ± 2.47	42 ± 2.63	58 ± 2.12	200
13	Nitrate (mg/L)	8.6 ± 0.3	8.1 ± 0.24	7.6 ± 0.56	11
14	Phosphate (mg/L)	1.0 ± 0.73	0.92 ± 0.03	1.6 ± 0.08	0.5
15	Biochemical oxygen demand (mg/L)	1.2 ± 0.47	2.14 ± 0.66	2.21 ±0.09	6.9

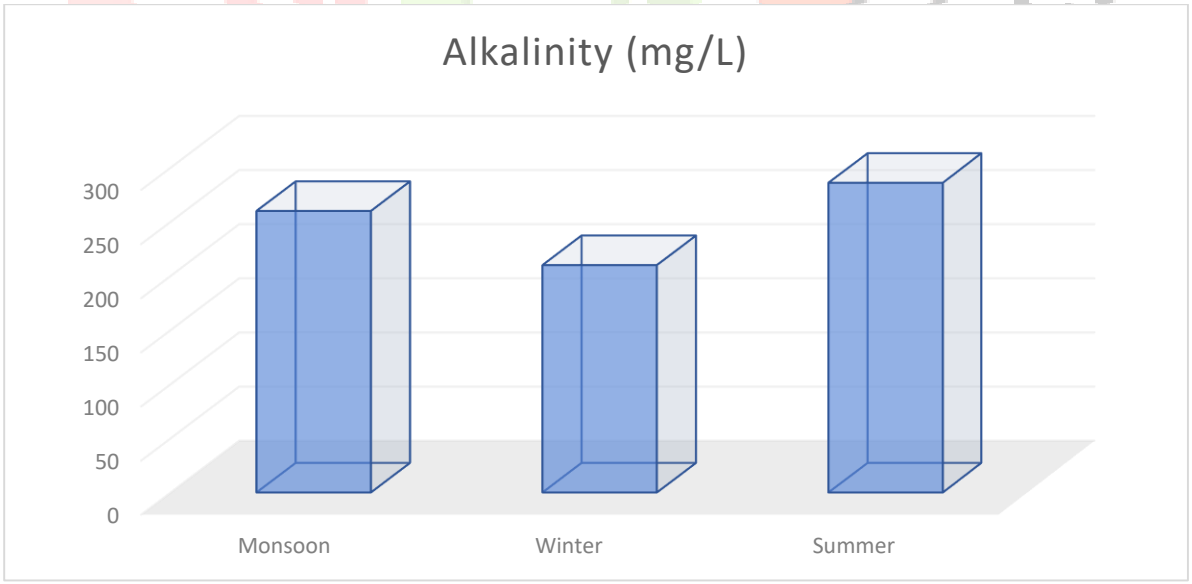

Temperature (°C)
30
25
20
15
10
5
0
Monsoon
Winter
Summer

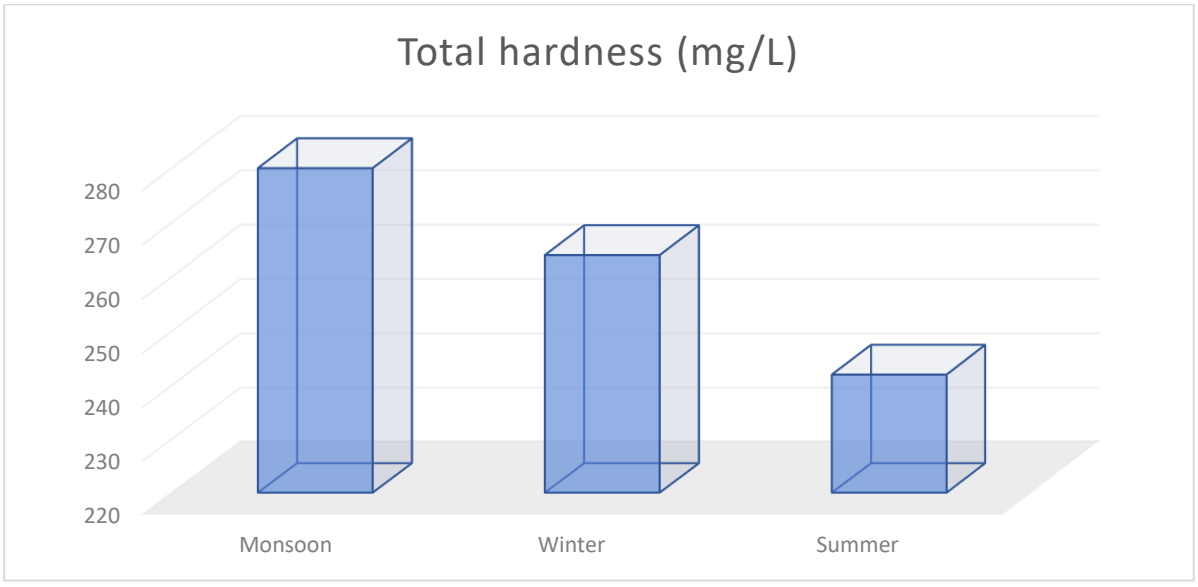

Electrical conductivity (Ω/cm)
3.7
3.6
3.5
3.4
3.3
3.2
3.1
3
2.9
Monsoon
Winter
Summer

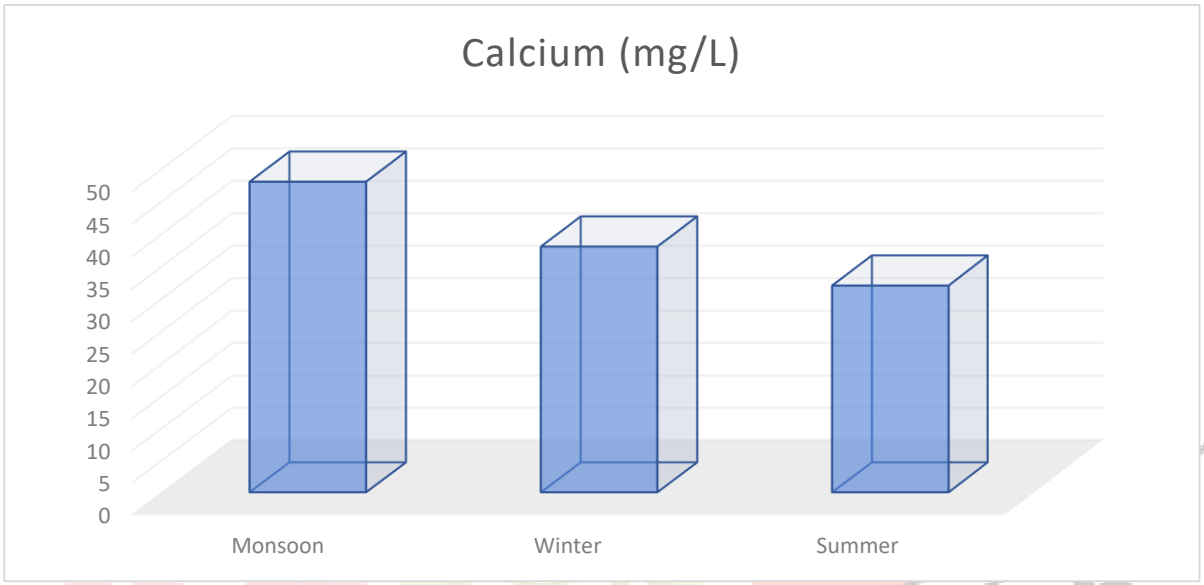

Turbidity (NTU)
30
25
20
15
10
5
0
Monsoon
Winter
Summer

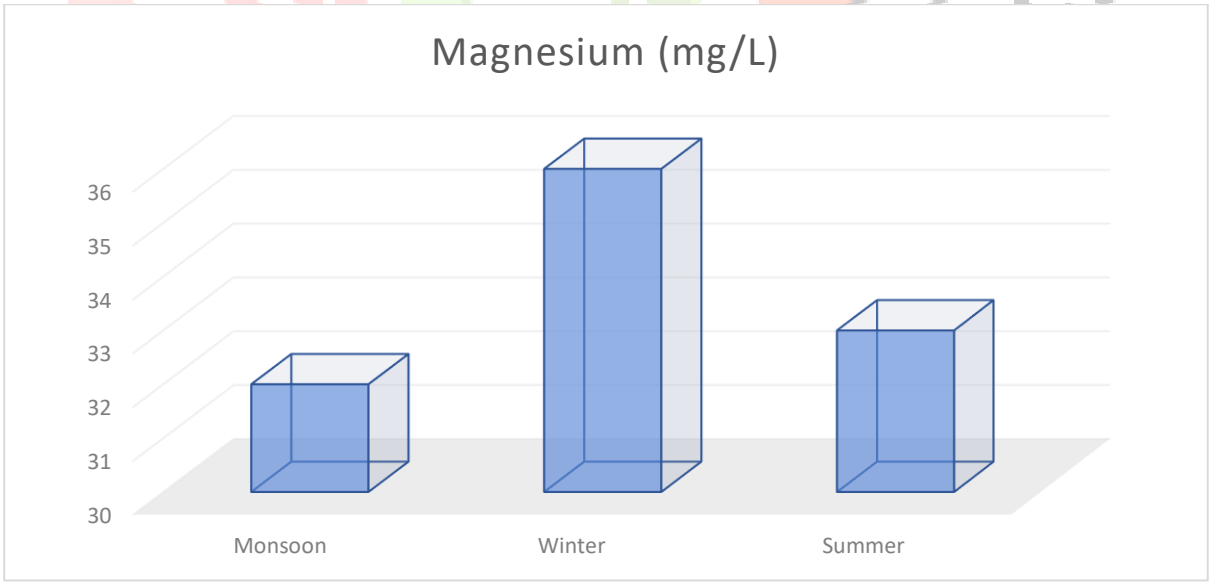

Total Dissolved Solid (mg/L)
12000
10000
8000
6000
4000
2000
0
Monsoon
Winter
Summer

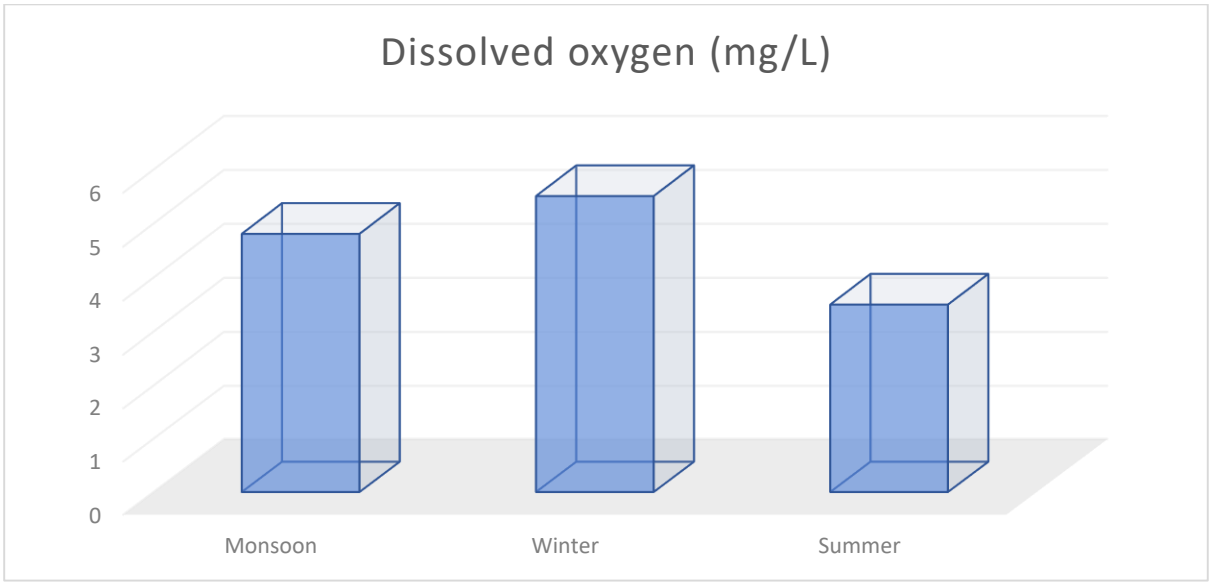

pH
7.5
7.45
7.4
7.35
7.3
7.25
7.2
7.15
7.1
7.05
Monsoon
Winter
Summer

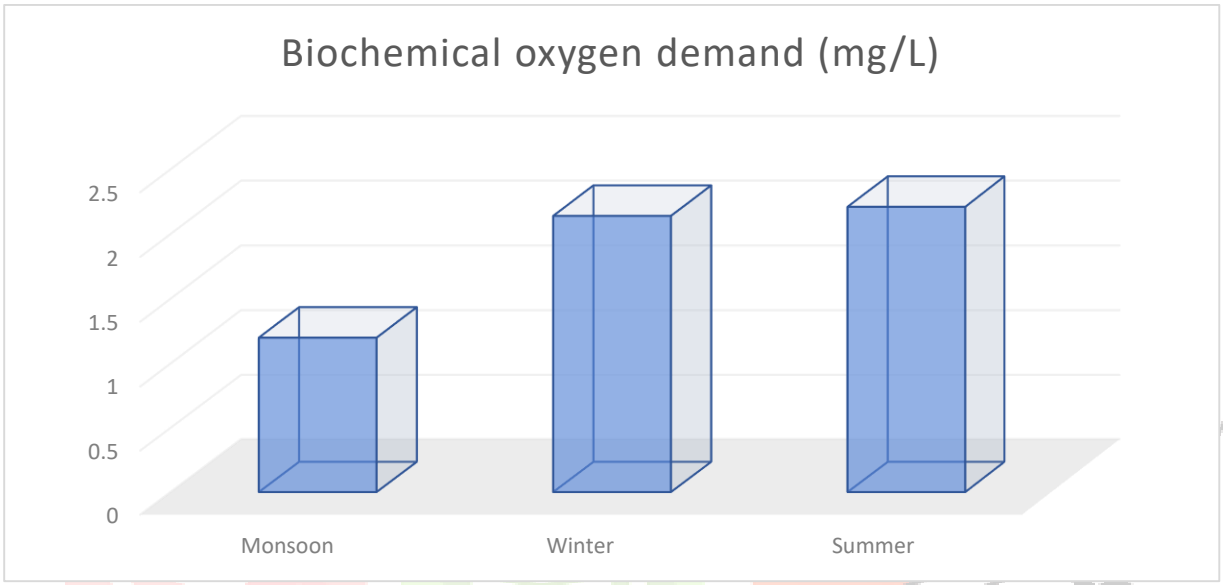

Alkalinity (mg/L)
300
250
200
150
100
50
0
Monsoon
Winter
Summer

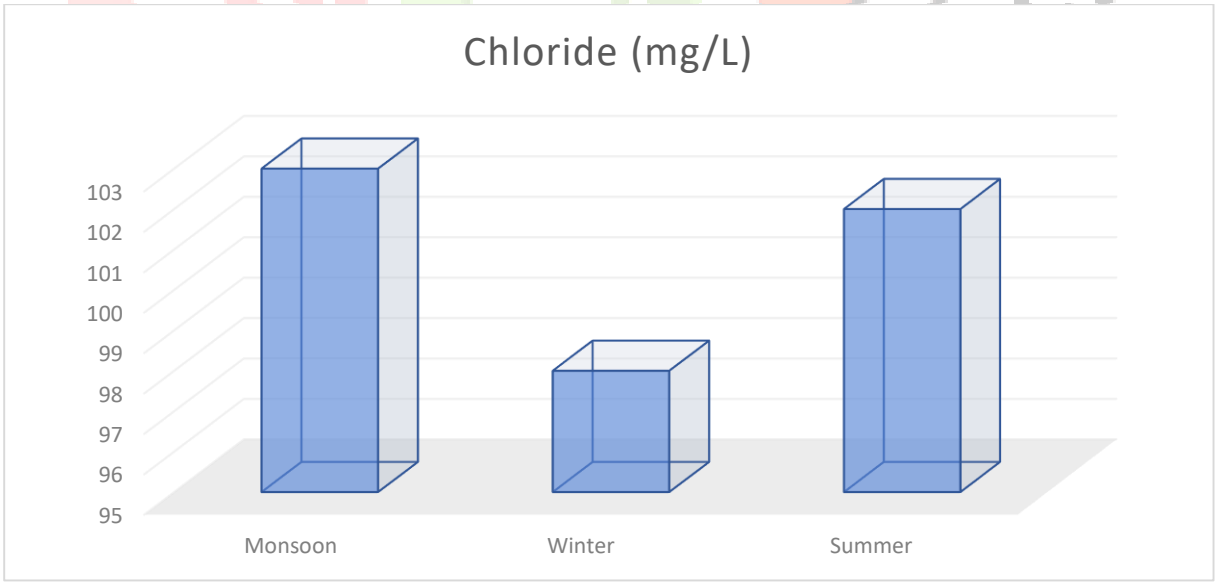

Total hardness (mg/L)
280
270
260
250
240
230
220
Monsoon
Winter
Summer

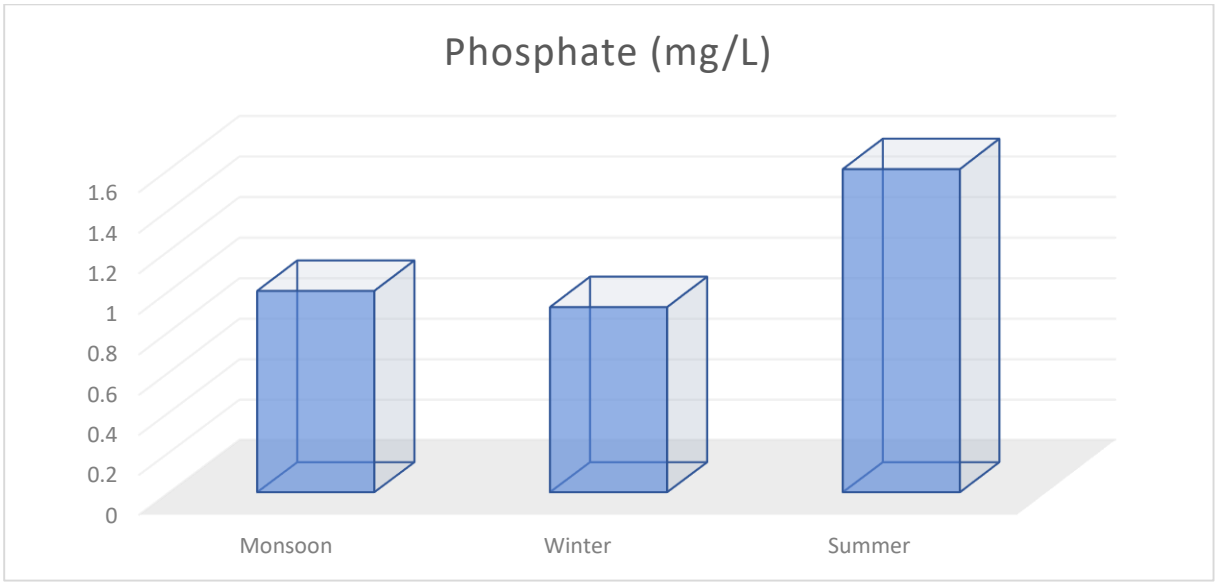

Calcium (mg/L)
50
45
40
35
30
25
20
15
10
5
0
Monsoon
Winter
Summer

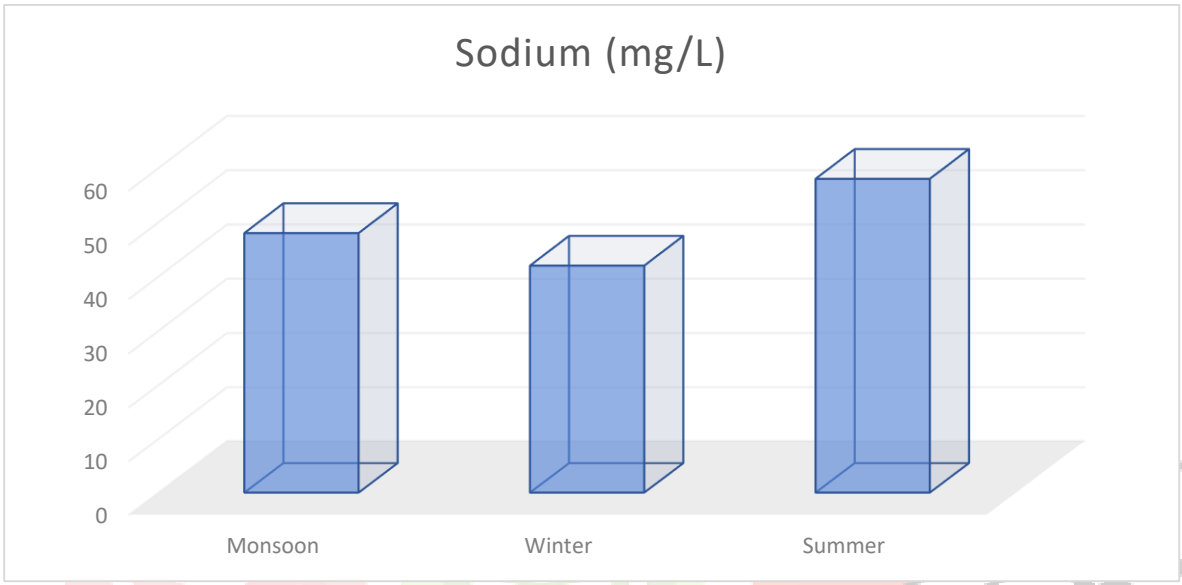

Magnesium (mg/L)
36
35
34
33
32
31
30
Monsoon
Winter
Summer

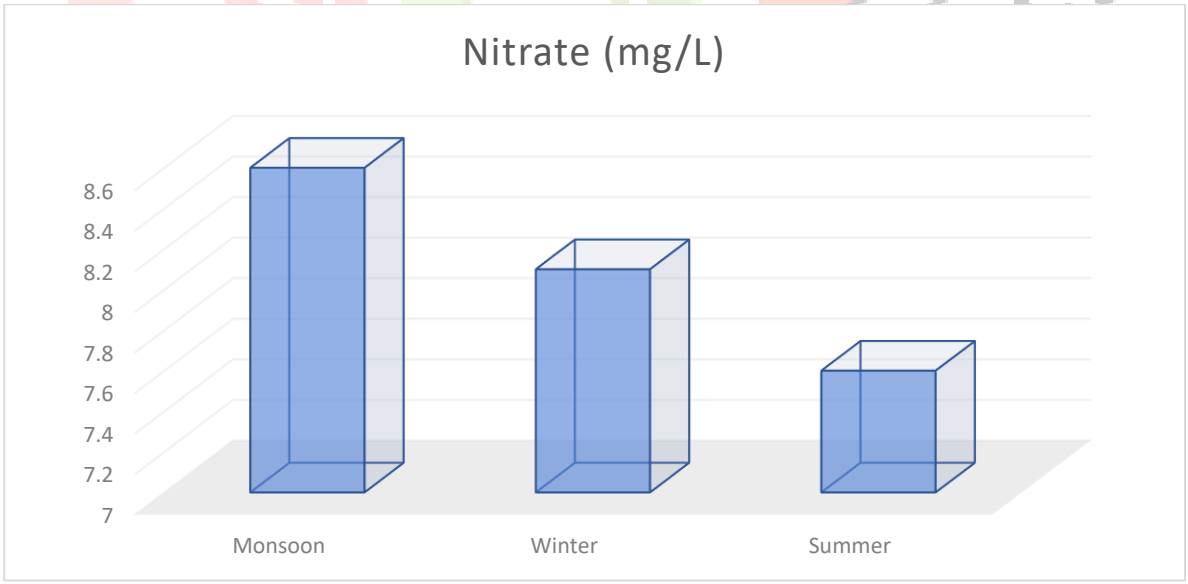

Dissolved oxygen (mg/L)
6
5
4
3
2
1
0
Monsoon
Winter
Summer


Biochemical oxygen demand (mg/L)
2.5
2
1.5
1
0.5
0
Monsoon
Winter
Summer


Chloride (mg/L)
103
102
101
100
99
98
97
96
95
Monsoon
Winter
Summer







Graphical representation of analysed parameters

pH

We observed a high pH of lake water (7.5) that was correlated with high biotic and abiotic component breakdown activities [15]. Due to the formation of CO_2 from biological oxidation processes, the low pH of 7.2 was observed throughout the winter, which may have ultimately contributed to the drop of pH [16].

Alkalinity

Due to the build up of organic matter brought on by vegetation death and decomposition, which in turn increased carbonate and bicarbonate concentrations in the lake water content, the highest value of alkalinity recorded throughout the summer was 286 mg/L [17]. Wintertime alkalinity levels were lowest (210 mg/L) , which can be attributed to freshwater influx and calcium carbonate ions dissolving in the water column [18].

Total Hardness

Due to the high level of calcium and magnesium ions, as well as sulphate and nitrate in the sewage waste discharged during the monsoon, the maximum amount of overall hardness in the water was observed at 280 mg/L during this time [19]. Due to the lake's high rate of vegetation and low water volume during the summer, the lowest quantity of total hardness was found to be 242 mg/L.

Calcium

The lowest amount of calcium was 32 mg/L recorded during summer season due to calcium being absorbed by a large number of organisms, while the highest amount of calcium content in water was recorded during monsoon season as 48 mg/L. Jhingran suggested that calcium is one among the most abundant ions in freshwater and plays a crucial role in shell construction, bony formation, and bone density. In ion exchange reactions, magnesium behaves similarly to calcium and influences sodium absorption on an identical basis [22].

Magnesium

Since magnesium is a limiting element for the growth of phytoplankton and is necessary for photosynthesis in chlorophyll-bearing plants, the largest level of magnesium, 36 mg/L, was detected during the winter season [23]. The summertime estimate for the lowest value was 32 mg/L .

Dissolved Oxygen (DO)

The highest concentration of dissolved oxygen was 5.5 mg/L during the winter because oxygen is more soluble at lower temperatures, while the lowest concentration of dissolved oxygen was 3.50 mg/L during the summer because of the high temperature and the addition of sewage and other wastes, which significantly decreased the dissolved oxygen content.

Chloride

The regular run-off of contaminated water from nearby sources caused the maximum chloride concentration, which was recorded to be 103 mg/L, in the summer. The presence of organic debris, most likely of an animal origin, is indicated by the high chloride concentrations [24]. During monsoon season, the lowest level of chloride was 98 mg/L and can be attributed to the lake's dilution by rainwater. Solanki and Pandit assert that the cleanliness or impurity of the water can be connected to the concentration of chlorides [20].

Sodium

The addition of waste water comprising soap solution and detergent from the nearby slum area led to the maximum quantity of sodium being detected during the summer of 58 mg/L[25]. Due to the volume of water contracting in the summer, the sodium content is at its greatest [26]. Wintertime saw the lowest level of 42 mg/L, because of bioaccumulation by living things.

Nitrate

Due to the potential influx of nitrogen-rich flood water from the significant amount of tainted sewage water into the lake water, the maximum amount of 8.6 mg/L of nitrate was detected during the monsoon season [27]. The lowest concentration of nitrate in water was 7.6 mg/L during the summer and may have been caused by plankton and aquatic plants using it for metabolic processes.

Phosphate

The maximum concentration of phosphate (1.6 mg/L) was found during the summer and was linked to residential sewage entering the lake's water. In their investigation into fish mortality in the lake waters of Bangalore, India, Benjamin et al. found a similar outcome [1]. Hastler noted that even little amounts of nitrogen and phosphorus added consistently to an aquatic environment could significantly promote algal development [28]. The winter season saw the lowest concentration of phosphate, 0.96 mg/L as a result of enhanced phosphate intake for macrophytes' luxuriant growth.

Biological Oxygen Demand (BOD)

Due to the strong bacterial activity and significant organic matter input in the lake water, the maximum biochemical oxygen demand was measured during the summer at 2.21 mg/L [29]. Due to less vegetation and slow organic matter breakdown at low temperatures, the monsoon season had the lowest projected requirement of 1.2 mg/L.

We were able to research the contamination level of this water body by comparing several physico-chemical data extracted from Karanji lake of Mysore. Turbidity, total dissolved solids, alkalinity, pH, hardness, and phosphate levels, for example, are all much higher than average. The content of magnesium and chloride ions as well as the biological oxygen requirement are high during the monsoon season, according to a comparison of estimated quantities from Chandola Lake in Ahmedabad [3].

The biological oxygen requirement appears to drop during the summer monsoon as do the amounts of chloride, nitrate, and sodium ions. Comparatively speaking, Karanji lake is less polluted. Estimating the physico-chemical parameters in accordance with the W.H.O. recommendations [14] may help the local government modify sustainable strategies to improve the water quality.

Conclusion

According to the statistics from the physico-chemical analysis of the water quality in Karanji lake, Mysore, most significant quantities, including turbidity, total dissolved solids, pH, hardness, alkalinity, and phosphate contents, are above the W.H.O. guidelines' upper threshold. The aquatic and terrestrial creature growth in the water repository may be significantly impacted by the current situation, and soon, major contaminants that emerge from

domestic sections represent an additional threat to the water quality. The civic body must take specific actions and make plans to reduce lake pollution to preserve the ecological and aquatic life in the lake.

References

1. Basavaraja, S.M., Simpi, K.N.S., Hiremath, K.N. Murthy and N.A. Chandrashekarappa, Patel, Puttiah, E.T. (2011). Analysis of Water Quality Using Physico-Chemical Parameters Hosahalli Tank in Shimoga District, Karnataka, India, Global Jr. of Sci. Frontier. Res. 1(3), 31-34.
2. Hari, O.S., Nepal,M.S. Aryo and Singh, N. (1994). Combined effect of waste of distillery and sugar mill on seed germination, seeding growth and biomass of okra. Jr. of Environ. Bio, 3(15), 171- 175.
3. Sidnei, M.T., Fakio, A.L., Maria, Francises, A.E. and Adaunto, F. (1992). Seasonal variation of some limnological factors of Lagoa does Guarana; a Varzea lake of the Rio Paranana State of Mato Groso does Sul, Brazil. Rev. Hydrobiol., 25(4), 269-276.
4. Benjamin R, Chakrapani BK, Devashish K, Nagarathna AV, Ramachandra TV, et al. (1996) Fish mortality in Bangalore lakes, India. Electronic Green Journal,
5. Retrieved from http://egj.lib.uidaho.edu/egj06/ramachandra.html.
6. Agbaire PO and OBI CG (2009) Seasonal Variation of some physico-chemical properties of River Ethiope water in Abraka, Nigeria. Journal of Applied Sciences and Environmental Management 13: 55-57.
7. Verma P, Chandawat D, Gupta U, Solanki HA (2012) Water quality analysis of an organically polluted lake by investigating different physical and chemical parameters. International Journal of Research in Chemistry and Environment 2: 105-112.
8. Uduma AU (2014) Physicochemical analysis of the quality of sachet water consumed in kano metropolis. American Journal of Environment, Energy and Power Research 2: 1-10.
9. Smitha (2013) Physico-chemical analysis of the freshwater at River Kapila, Nanjangudu Industrial Area, Mysore, India. International Research Journal of Environment Sciences 2: 59-65.
10. Verma PU, Purohit AR, Patel NJ (2012) Pollution status of Chandlodia Lake located in Ahmedabad Gujarat. International Journal of Engineering Research and Applications 2: 1600-1610.
11. Reasoner DJ (2004) Heterotrophic plate count methodology in the United States. Int J Food Microbiol 92: 307-315.
12. Singh RP, Mathur P (2005) Investigation of variations in physicochemical characteristics of a fresh water reservoir of Ajmer city, Rajesthan. Indian Journal Environmental Sciences 9: 57-61.
13. Swarnalatha N, Narasingrao A (1998) Ecological studies of Banjaralake with reference to water pollution. Journal of Environmental Biology, 19: 179-186.
14. Bohra OP, Bhargava SC (1977) Abiotic factor, chlorophyll pigment and primary production in two lakes of Jodhpur. Geobios 4: 215-216.
15. Murugesan A, Ramu A, Kannan N (2006) Water quality assessment from Uthamapalayam municipality in

Theni District, Tamil Nadu, India. Pollution Research 25: 163-166.

16. Ahluwalia AA (1999) Limnological Study of wetlands under Sardar Sarovar command area. Ph.D. Thesis, Gujarat University, Ahmedabad.
17. Kumar SM, Ravindranath S (1998) Water Studies-methods for monitoring water quality. Center for Environment Education (CEE), Banglore, Karnataka, India, 191.
18. World Health Organization (W.H.O.) (1998) Guideline for drinking water quality. Health criteria and other supporting information (2ndedn) Geneva, 2: 231 -270.
19. Chaudhary S, Anuradha, Sastry KV (2004) Pollution of River Yammuna at Faridabad Hariyana. Pollution Research 23: 749-756.
20. Solanki HA (2007) Ecological studies of phytoplankton of Mini Mahi River, Gujarat, India. Vidya 2: 47-57.
21. Jain CK, Bhatica KKS, Vijay T (1997) Ground water quality in coastal region of Andraapradesh. Indian Journal of Environmental Health 39: 182-190.
22. Padma S, Periakali P (1999) Physicochemical and geochemical studies in Pulicat lake, east coast of India. Indian Journal of Geo-Marine Sciences 28: 434-437.
23. Angadi SB, Shiddamallayya N, Patil PC (2005) Limnological studies of Papnash pond, Bidar (Karnataka). J Environ Biol 26: 213-216.
24. Solanki, Pandit BR (2006) Trophic status of lentic waters of ponds water of Vadodara, Gujarat state, India. Inernational Journal of Bioscience Reporter 4: 191-198.
25. Jhingran VG (1975) Fish and Fisheries of India. Hindustan Publication Corporation, New Delhi, 954.
26. Paliwal PV, Yadav BR (1976) Irrigation water quality and crop management in the union territory of Delhi report. Water Technology Centre, IART, New Delhi.
27. Dagaonkar A, Saksena DN (1992) Physicochemical and biological characterization of a temple tank, Kaila Sagar, Gwalior, Madhya Pradesh. Hydrobiologia, 8: 11-19.
28. Tresh JC, Suckling EV, Beale JF (1944) Chemical and zoopklankton studies of lentic habitats in North Eastern New South Wales. Australian Journal Marine Freshwater Research, 21: 11-33.
29. Mishra SR, Saxena DN (1991) Pollution ecology with reference to physciochemical characteristics of Morar (Kalpi) river Gwalior (M.P). In: Shastree NK (ed.), Current Trends in Limnology 159-184.
30. Solanki HA (2001) Study on pollution of soils and water reservoirs near industrial areas of Baroda. Ph.D Thesis submitted to Bhavnagar University, Bhavnagar.
31. Zimba PV, Khoo L, Gaunt PS, Brittain S, Carmichael WW (2001) Confirmation of cat fish, IctaluruspunciatusRalfinesque, mortality from microcystis toxins. Journal of Fish Diseases 24: 41-47.
32. Hastler AD (1947) Eutrophication of lakes by domestic drainage. Journal of Ecology, 28: 383-395.

33. Campbell IC (1978) A biological investigation of an organically polluted urban stream in Victoria. Australian Journal of Marine & Freshwater Research 29: 275-291.