Water Quality Assessment of Kapila River of Nanjanagudu, Mysore, India

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Abstract- In the Indian state of Karnataka's Mysore district, Nanjanagud is the location to several industries. It is situated along the Kapila River's banks. (Kabini). During the months of March, April, and May, water quality was tested using criteria including odor, turbidity, temperature, pH, dissolved oxygen (DO), total dissolved solids (TDS), chloride, total hardness, calcium hardness, magnesium hardness, nitrate, and sulphate. The findings demonstrated that river pollution occurred in May, as indicated by an increase in the level of organic load.

Keywords: River Kapila, dissolved oxygen, chloride.

INTRODUCTION

Living things require water as a critical resource. Water is a fundamental element of all living things since it is involved in most biochemical events that occur throughout the metabolism and growth of living things. Since no life can exist on this planet without water, it is known as "Natural liquid Gold." As most inorganic substances dissolve in water, it is also known as the "universal solvent." 71% of the surface of the globe is covered by water, but only 3% of that water is fresh water, which is found in the form of ice caps, glaciers, rivers, lakes, ponds, streams, and ground water supplies. The river is the most significant and sensitive freshwater system and is essential to the survival of all species. Freshwater systems' sustainability is under risk due to the deteriorating water quality, which is a cause for concern [1].

The condition of India's freshwater resources and how they are managed have recently been described as a serious environmental issue, with major impacts including nutrient enrichment, acidification, and toxic substances found in household waste, agricultural waste, sewage, and industrial effluents [2–6]. According to a study, biological, organic, and inorganic pollutants have contaminated about 70% of India's surface and ground water resources[7].

Increased human population, industrialization, fertilizer use in agriculture, and human activity all contribute to water pollution [8]. The existence of water constituents at their ideal levels, which support the growth of plants and animals, is referred to as the water quality. The growth of living things depends on a variety of parameters, including temperature, turbidity, nutrition, hardness, alkalinity, dissolved oxygen, and others. The relationship between all hydrological characteristics, such as the physical, chemical, and biological characteristics of the water body, is referred to as water quality. Analysis of physical, chemical, biological, and microbiological factors that indicate the biotic and abiotic status of ecosystems are thus necessary for determining the quality of water.

The goal of the current study is to examine the water quality of the Kapila River in the Nanjanagud industrial region. The Kabini, also known as the Kapila. It's a river that runs through southern India. It starts in the Kerala state's Wayanad district and runs east to join the River Kaveri, which drains into the Bay of Bengal.

MATERIAL AND METHODS

Study area:

The study area included 2 sites of River Kapila at Nanjanagud industrial area. Nanjanagud is a town located inMysore district of Karnataka state, India. It is situated on the banks of River Kapila and lies at distance of 23 km from Mysore city. It is situated at 12°07'N 76°41' E/ 12.12°N 76.68°E. Branches of many Indian and multinational companies are in Nanjanagud Industrial Area and is spread across 532 acres.

Analysis of water quality parameters: A total of 12 water quality parameters were selected to monitor

during the study period (December2022 to March 2023). Water samples were collected from two sampling sites and transported to laboratory for analysis. Temperature and pH were recorded immediately at study site itself. Water samples were analyzed for various physicochemical parameters using standard method [9].

RESULTS AND DISCUSSION

Turbidity:

In the month of March , turbidity levels were quite high and exceeded the permitted level. This could be the result of wastewater discharge as well as stagnation. The River Ganga's turbidity was measured at 398.5 NTU, which is greater than the current result; this could be because of the Ganges' strong current and natural sedimentation[10].

Temperature: The temperature is regarded as a physiologically significant component and plays a considerable impact in the metabolic processes of organisms[11]. The changing climate is a factor in water temperature variation[12]. The hydrosphere's fluctuating temperatures produce distinctive water circulation patterns that have a significant impact on aquatic life. From December 2022 to March 2023, the study's water temperature ranged from 23^0C to 29^0C at sampling site 1 and 24^0C to 29^0C at site 2.

One of the most significant tests frequently done on natural waterways is pH. The biological activity and changes in the ambient atmosphere's temperature have a significant impact on the pH of water. During the study period, the pH values varied between 6.7 and 7.35 at site 1 and 6.8 and 7.20 at site 2. The pH in the current investigation was within acceptable bounds. The mucus membrane of the cells will be impacted if pH is higher than what is acceptable[13].

Total dissolved solids:

Total dissolved solids are a measure of the degree of dissolved substances and depend on a number of variables, including rainfall and the amount of surface runoff [14]. Throughout the course of the trial, the results oscillate between a range of 136.8 and 190 mg/L in site 1 and 14 and 196 mg/L in site 2. Aquatic species are impacted by total solids-induced turbidity. It could be abrasive and harm or clog the surfaces of the respiratory system.

Dissolved oxygen

Dissolved oxygen is a crucial measure in the investigation of water quality. It shows if a body of water can support aquatic life. The amount of oxygen in the water is indicated by the amount of dissolved oxygen. The byproducts of chemical and biological reactions in anaerobic water bodies give the water an unpleasant color, odor, and taste [15]. By oxidizing the organic compounds and organic debris in the water, DO is consumed. Fish and other aquatic species can die in water with low oxygen levels. DO values in the current study ranged from 4.2 to 5.4 mg/L in site 1 and 4.8 to 5.6 mg/L in site 2.

Chlorides:

During the study period, the values of chloride content varied from 13 to 52 mg/L in site and 15 to 48 mg/L in. The majority of naturally occurring cat ions are extremely soluble in chloride, which does not precipitate sediment and cannot be eliminated biologically. All kinds of water include chloride. Chloride concentration indicates the existence of sewage-related contamination. Greater amounts of chloride react with sodium to make the water saltier and raise its TDS levels [16]. Its concentration normally stays low in waters that are found in nature.

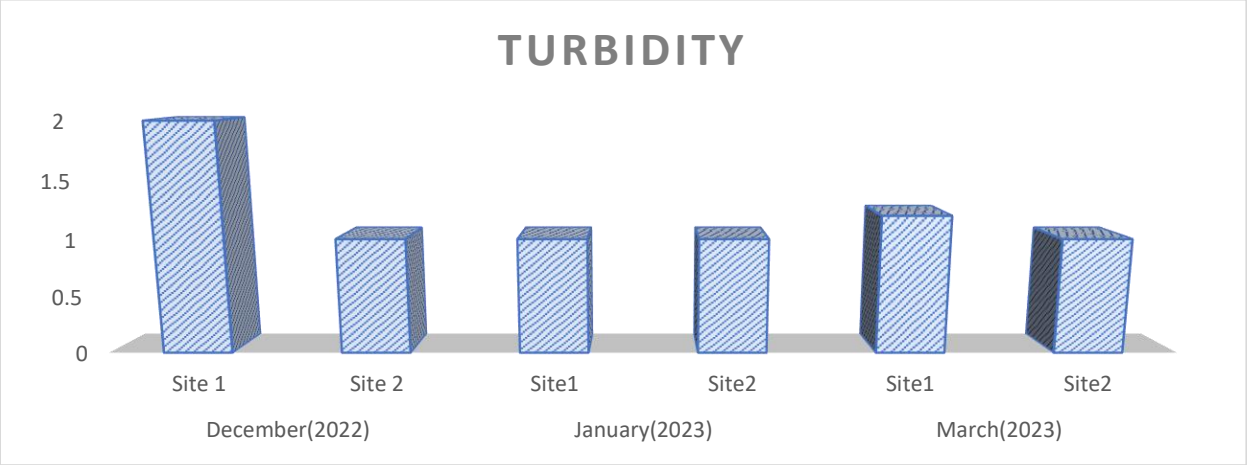
Calcium and magnesium

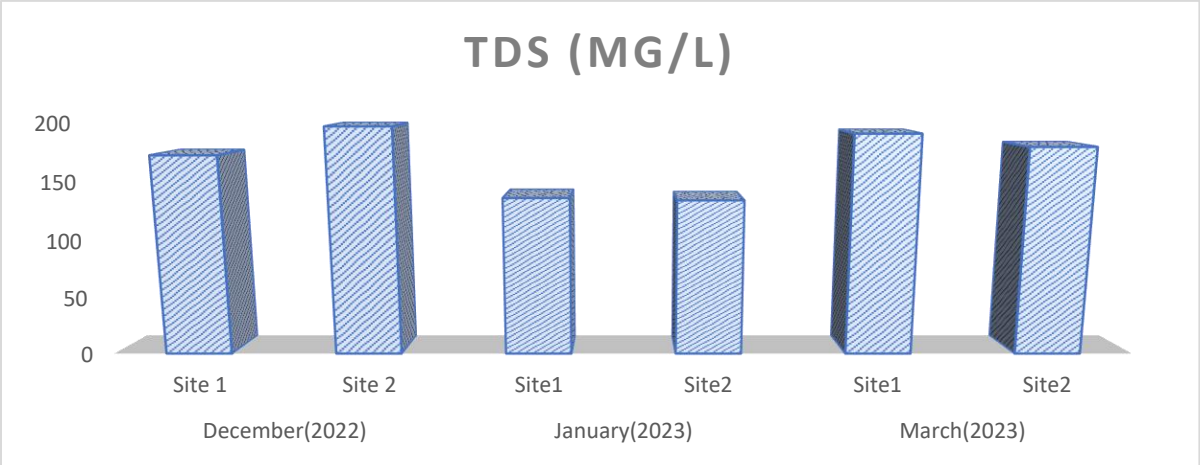
Calcium and magnesium are the most divalent cat ions, while hardness refers to the total amount of polyvalent cat ions in the water. During the study period, hardness in sites 1 and 2 varied from 70 to 140 mg/L and 80 to 148 mg/L, respectively. Dufor and Backer's categorization classifies 180 ppm of hardness as very hard[17].

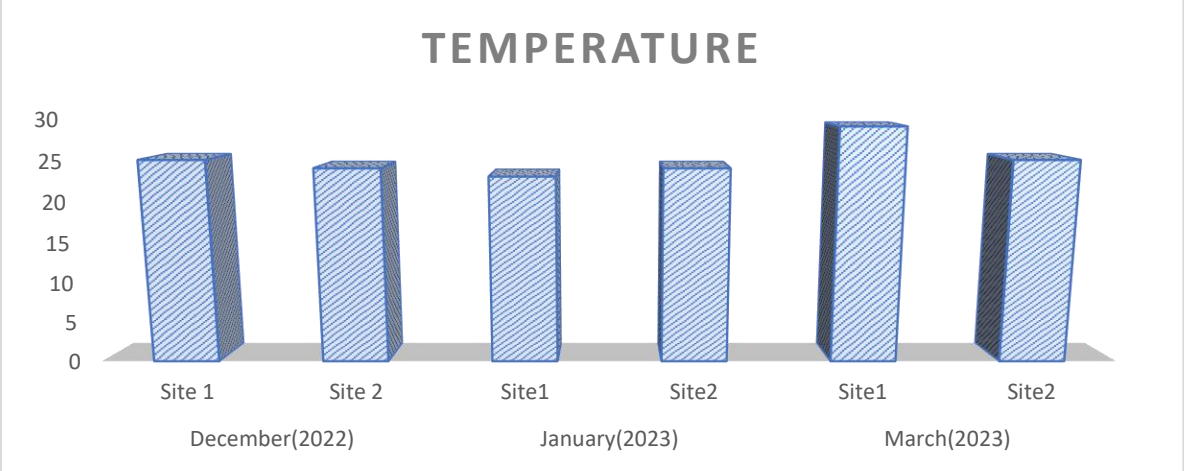
Table-1 Physico-chemical characteristics of water samples in River Kapila.

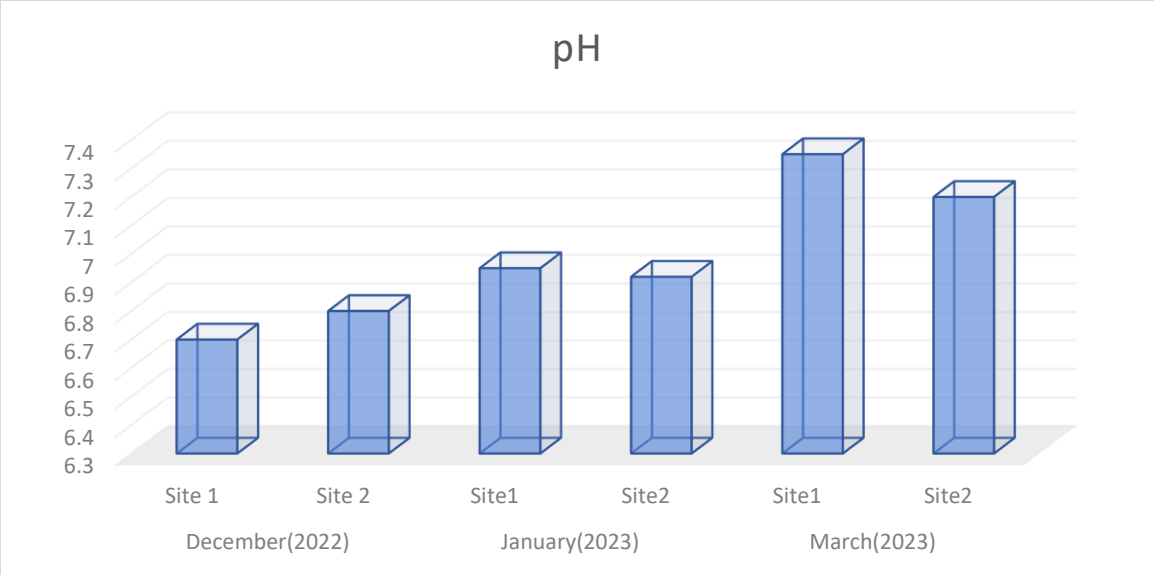
Parameters	December(2022)		January(2023)		March(2023)	
	Site 1	Site 2	Site1	Site2	Site1	Site2
Turbidity	2	1	1	1	1.2	1.0
Temperature (^{0}C)	25^0C	24^0C	23^0C	24^0C	29^0C	25^0C
pH	6.7	6.8	6.95	6.92	7.35	7.20
TDS (mg/L)	172	196	136	134	190	179
DO(mg/L)	4.2	4.8	5.4	5.9	5.1	5.7

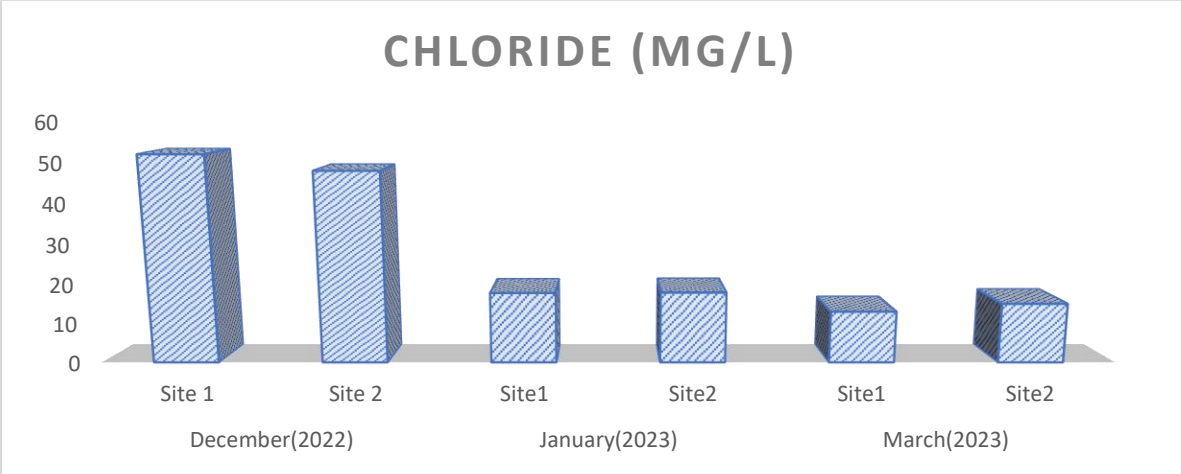
Chloride (mg/L)	52	48	17.75	17.86	13	15
Hardness(mg/L)	91	103	70	90	140	129
Calcium Hardness(mg/L)	24.48	25.0	16.8	21.6	24.48	21.29
Magnesium Hardness(mg/L)	7.87	7.80	8.4	10.3	16.65	12.80
Nitrate (mg/L)	2.8	2.0	1.5	1.7	1.89	2.0
Sulphate (mg/L)	6	6.2	5	4.9	7	6.6

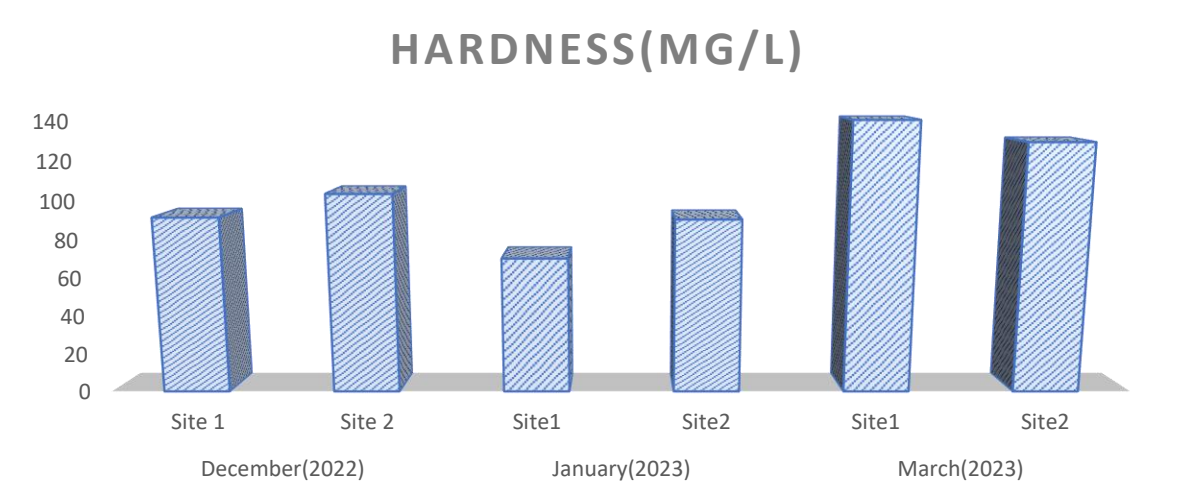


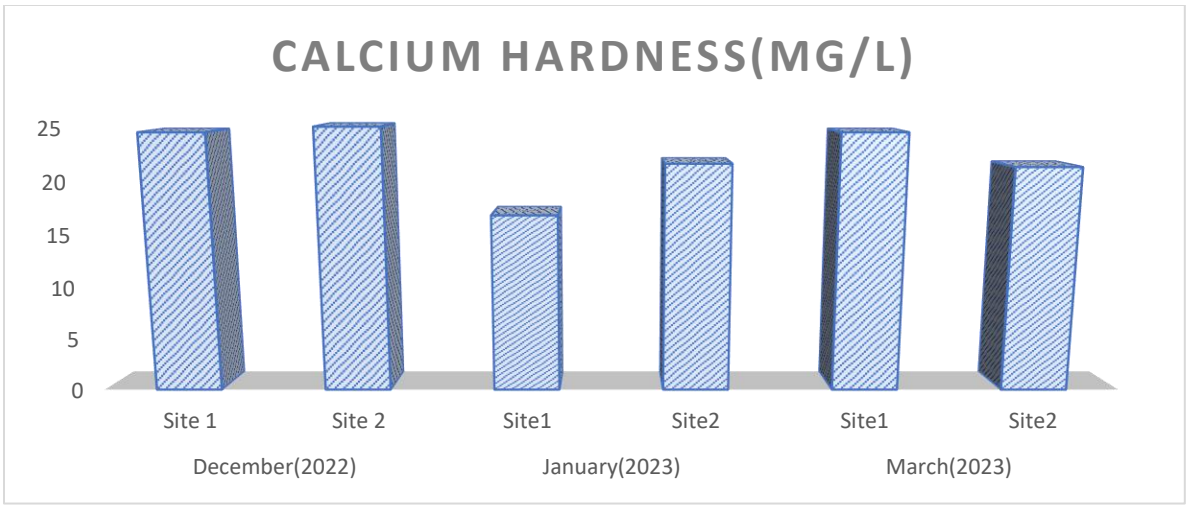


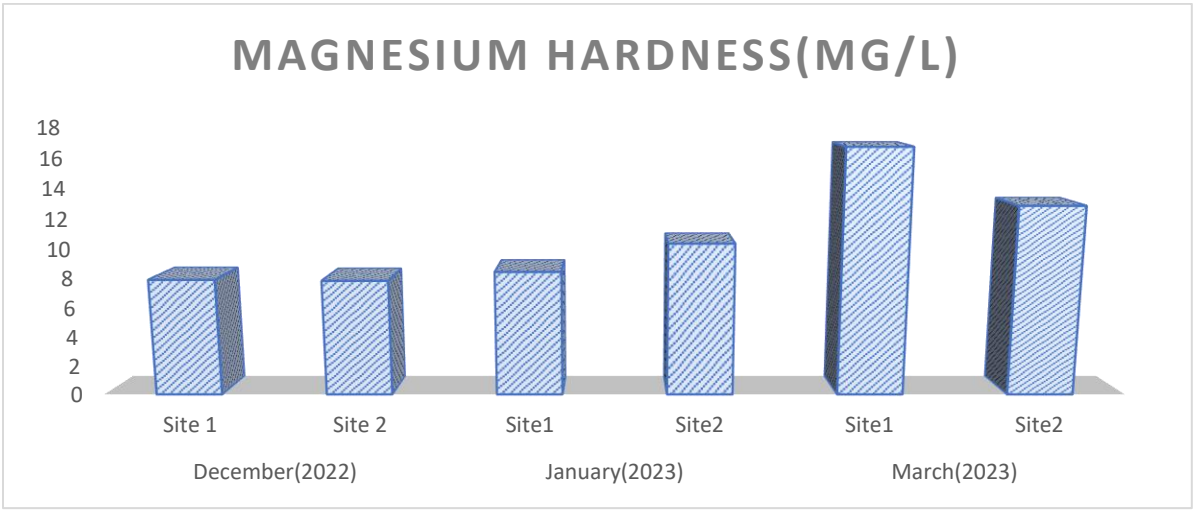


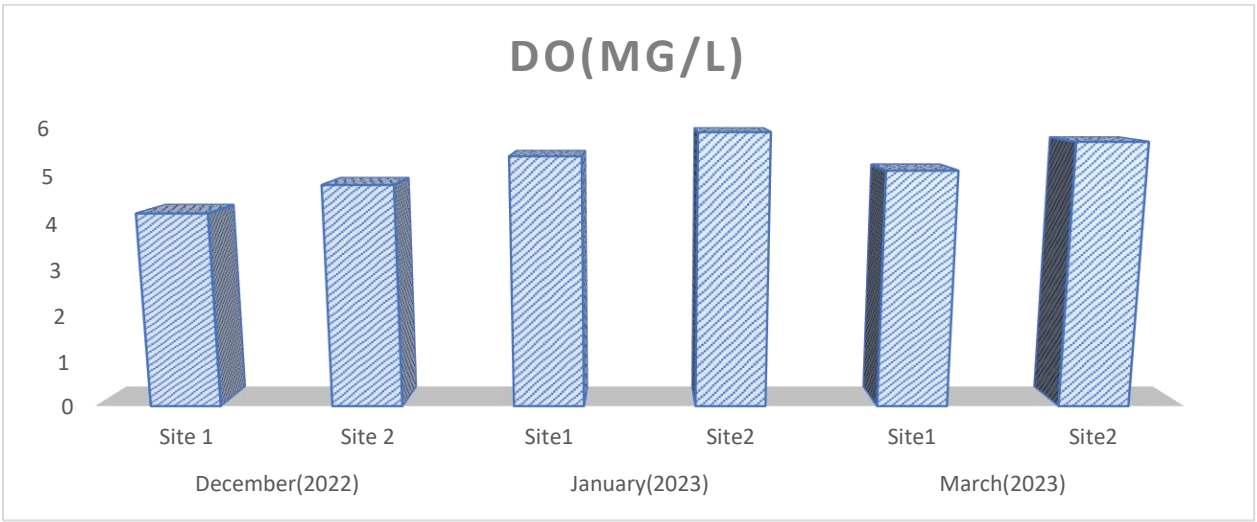

pH
7.4
7.3
7.2
7.1
7
6.9
6.8
6.7
6.6
6.5
6.4
6.3
Site 1
Site 2
Site1
Site2
Site1
Site2
December(2022)
January(2023)
March(2023)

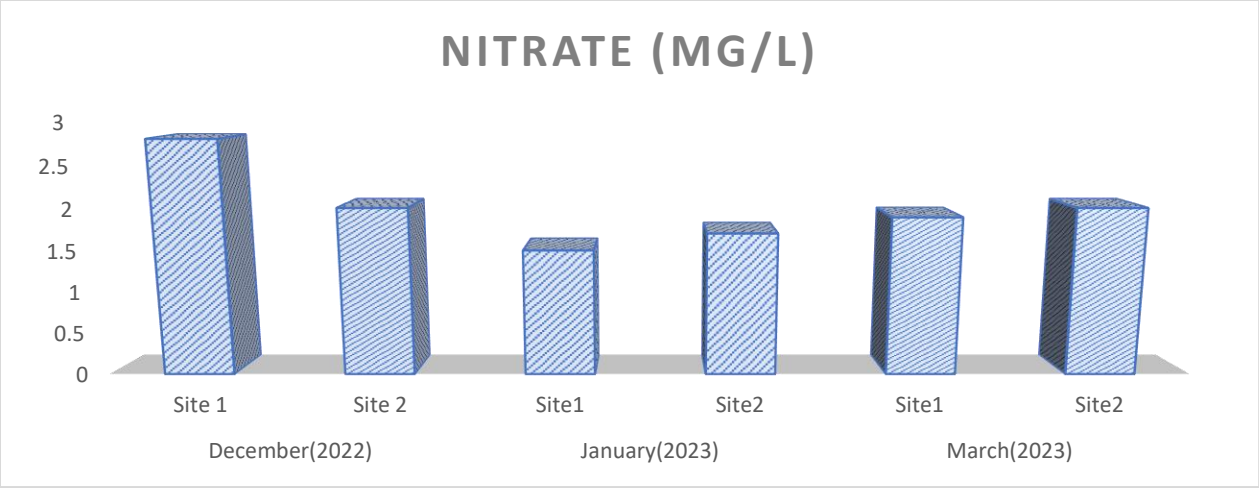

CHLORIDE (MG/L)
60
50
40
30
20
10
0
Site 1
Site 2
Site1
Site2
Site1
Site2
December(2022)
January(2023)
March(2023)

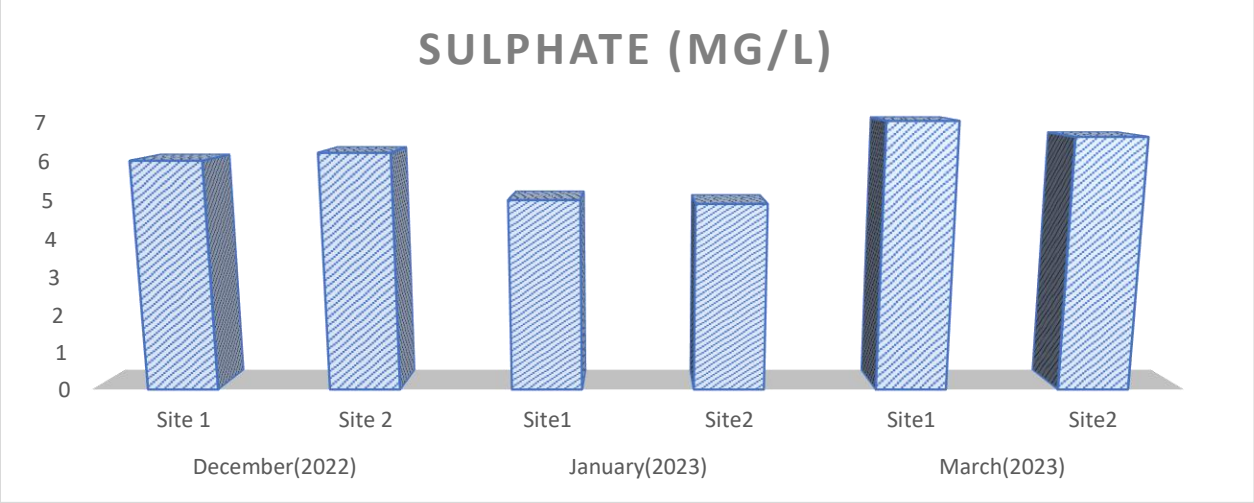

HARDNESS(MG/L)
140
120
100
80
60
40
20
0
Site 1
Site 2
Site1
Site2
Site1
Site2
December(2022)
January(2023)
March(2023)


CALCIUM HARDNESS(MG/L)
25
20
15
10
5
0
Site 1
Site 2
Site1
Site2
Site1
Site2
December(2022)
January(2023)
March(2023)


MAGNESIUM HARDNESS(MG/L)
18
16
14
12
10
8
6
4
2
0
Site 1
Site 2
Site1
Site2
Site1
Site2
December(2022)
January(2023)
March(2023)


DO(MG/L)
6
5
4
3
2
1
0
Site 1
Site 2
Site1
Site2
Site1
Site2
December(2022)
January(2023)
March(2023)





Graphical representation of analyzed parameters

Nitrates:

Through drainage systems, human and animal waste, industrial effluents, agricultural wastes, and silage are the main sources for nitrate deposition in river water. According to the current investigation, site 1 had nitrate levels between 1.5 and 2.8 mg/L and site 2 had levels between 1.6 and 1.9 mg/L. Nitrate contamination of water can be lethal to newborns who consume formula milk, resulting in the "blue baby" syndrome and digestive system malignancies. Eutrophication is aided by the growth of algae as a result. Nitrate in surface water is a crucial consideration when evaluating the water quality[18].

CONCLUSION

The current investigation demonstrated that urban garbage and other organic contaminants had contaminated River Kapila water, causing fairly high concentrations of TDS, hardness, nitrate, and sulphate. The buildup of these pollutants can be harmful to aquatic and terrestrial life. It is advised to release treated wastewater into rivers from businesses and residences.

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