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Physico-chemical Investigation of Neera River Water Near Sarola Bridge Shirval, District Pune (Maharashtra), India

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ABSTRACT

Water pollution occurs when harmful substances in the form of chemicals or microorganisms contaminate a stream, rivers or other water body; degrading water quality and rendering it toxic to the environment. Water is uniquely vulnerable to pollution. Water is a universal solvent; hence water is able to dissolve more substances than any other liquid on earth. Also, it is one of the reasons, as why water is so easily polluted. Various toxic substances from agricultural area, sewage water and industries get readily dissolve in to it causing water pollution. Here, Neera river water is analyzed for its physic-chemical parameters in the year 2018-2019. Observed results show that some of the parameters like pH and nitrates are having higher concentration. It may be due to contamination of water body by various polluting agents.

Key words : *Water pollution, Microorganisms, Universal solvent, Toxic substances, etc.*

Introduction

Recent development has brought many undesirable modifications to environment with increased number of industries and population also. Because of unawareness and mismanagement of people, aquatic environment of water bodies get disturbed. Due to this problem, the development of new environment issues overcome and which give rise to new ideas in the field of monitoring and assessment of ecosystem. Here, monitoring and assessment provide the basic information on the condition of a water bodies (Kumar and Ravindranath, 19980. Environment, economic growth of our society and overall developments are highly affected by water, its quality and availability. Generally, the quality of water is affected by human activities and is disturbing due to increase in urbanization. Water is one of the most important and abundant compounds in the world as well as ecosystem. All living organisms on the earth need water for their survival and sustainable development (Jadhav and Jadhav, 2021).

Water is very important to run our body system, hence human body system cannot work/survive without water. Water quality can be affected by various pollutants like physical, chemical and biological (Jadhav and Jadhav, 2013). Also they include various types of bacteria, viruses, salts like chlo-

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rides, nitrates, sulphates and also heavy metals in some cases.

Neera river is a tributary of the Bhima river which flows through Pune and Solapur districts of Maharashtra. The river originates in Western Ghats in Pune district and flows from Bhor taluka, Shirval taluka of Satara district, Solapur district and then meets Bhima Basin at Neera Narsingpur near Akluj. The Dams on the Neera river are Devdhar dam and Veer dam in Satara and Pune district. Karha is a tributary of the Neera river.

Experimental

Materials and Methods

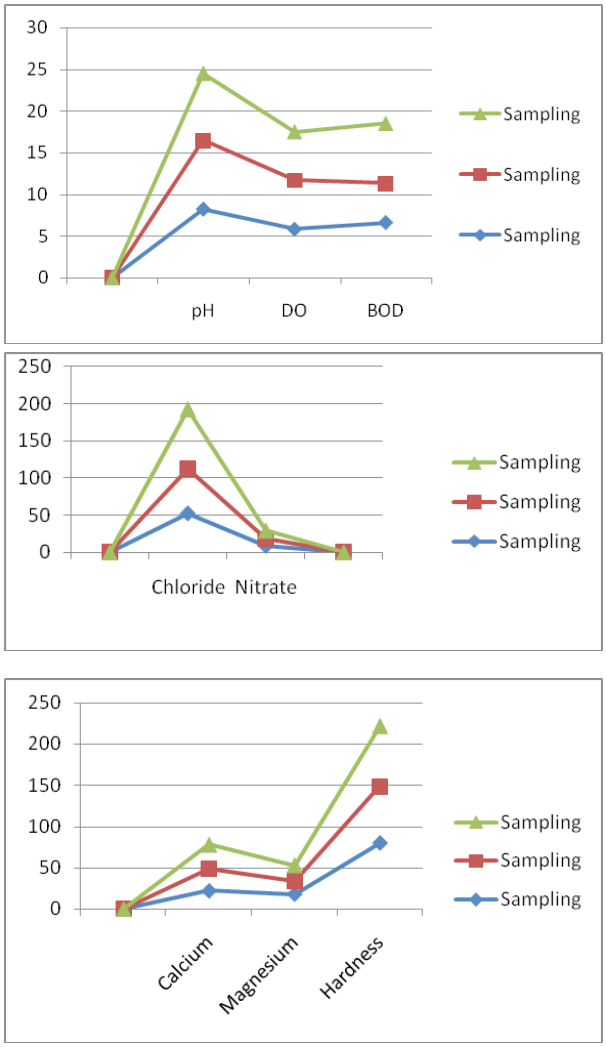
For this work we have selected various sampling stations from Neera river water for the study. From these sampling stations water samples were collected at regular intervals. While collecting the water samples, standard methods were followed which are given by APHA (1995). These samples were collected in one litre plastic bottles, which were washed properly with distilled water before the collection of water samples. After collection of water samples are preserved by taking precautions given by APHA (1995) and Trivedy and Goel (1984). Estimation of all the parameters was done by using the standard methods given by APHA (1995) and Trivedy and Goel (1684).

Results and Discussion

Neera river water was analyzed for the parameters like pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Chlorides, Nitrates, Calcium, Magnesium and Hardness. The results are likewise,

pH : Basically in the case of Indian rivers, if we go for the small pockets, they are observed alkaline in nature. Here, observed water is alkaline in nature.

Graphical Presentation of all the observed parameters



Observation table

Sr. No.	Parameters	Sampling Station 1	Sampling Station 2	Sampling Station 3	Sampling Station 4	Sampling Station 5	Sampling Station 6	Sampling Station 7
1	pH	8.2	8.3	8.01	8.2	8.1	8.3	8.9
2	DO	5.8	5.9	5.8	4.7	5.2	5.3	5.1
3	BOD	6.6	4.7	7.2	5.8	7.6	4.7	7.5
4	COD	20	22	30	26	32	28	36
5	Chloride	52	61	79	81	73	84	102
6	Nitrate	8.7	9.3	11.14	11.79	9.28	10.62	11.21
7	Calcium	22	27	29	33	28	42	56
8	Magnesium	18	16	19	21	18	16	17
9	Hardness	80	69	73	82	89	103	112

This may be due to solutes, which can show a buffering action, i.e. H^+ ions are compensated with OH^- (Vora *et al*., 1978) . Here, observed pH values are in the range of 8.01 to 8.9. The higher values of pH were recorded in summer season and minimum at winter season. We can also say that alkaline pH may be due to release of bicarbonate and carbonate ions in to river body (Sharma and Gupta, 2004). Generally, in summer decomposition activities took place in higher level, hence this may be one of the reasons for high pH in the summer season.

Dissolved Oxygen: In all water pollution studies, DO measurement is one of the important and primary parameter. In the water body if the aquatic life is good it means dissolved oxygen level is at higher level (Vijayan, 1991). Here, the observed values are in between 4.7 mg/l to 5.9 mg/l. During the period of photosynthesis, the higher amount of oxygen gets dissolved inside the water body.

Biochemical Oxygen Demand: In water pollution parameters, biochemical oxygen demand depends on aquatic life; BOD means the oxygen used by the microorganism in the aerobic oxidation of organic matter. Hence, with increase in organic matter BOD values increases (Singh and Mathur, 2005; Jadhav *et al.*, 2013). Here, observed BOD values are in the range of 4.7 mg/l to 7.6 mg/l. The higher values of BOD may be due to inputs of organic wastes as well as enhanced bacterial activity.

Chlorides: Important source of chlorides in the water body is disposal of sewage and industrial waste (Sirsath *et al.,* 2006). From the human body highest quality of chlorides are released through urine and faeces. Here, the amount of chloride observed is in the range of 52 mg/l to 102 mg/l, which is within permissible limit given by (BIS, 1991 and WHO, 1971).

Nitrates: Like chlorides, nitrates also enter to fresh water through the discharge of industrial waste, sewage along with agricultural runoff (Sharma *et al*., 1981). Here, the amount of nitrate observed in the range of 8.7 mg/ to 11.21 mg/l.

Calcium: Calcium is one of the most important and freely available ions in fresh water. The maximum amount of calcium is obtained in summer season and minimum in winter season. Due to decomposition of organic matter in the summer season, the amount of calcium gets increased (Billore, 1981). Generally, calcium is present in water naturally, but addition of sewage water/waste might be responsible for the increase in calcium concentration. Similarly in the winter season decrease in calcium is observed, it may be due to absorbance of calcium by living organisms.

Magnesium: Basically magnesium is often associated with calcium in all the water bodies, but the concentration of magnesium always remains lower than calcium (Venkatasubramani and Meenambal, 2007). The amount of magnesium influences the water quality (Govindan and Devika, 1991). Magnesium is one of the essential parameter for the chlorophyll growth.

Hardness: In any water body, the principle hardness causing ions are calcium and magnesium. The maximum amount of hardness was observed in summer season, it may be due to evaporation of water and addition of salts like calcium and magnesium by means of plants and living organisms (Govindan and Devika, 1991). Also, we can say that the higher amount of hardness may be due to the regular addition of sewage water and detergent in to the water body by the community.

Conclusion

The results obtained from this analysis are compared with standard values given by WHO and BIS. It was found that some of the parameters are observed beyond the permissible limit, at some of the sampling stations. It shows that the river water receives very high amount of pollutants from the surrounding area, due to which river water get contaminated and if it remains for a longer time then river water become ecological inactive.

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