

Study of Water Quality Parameters of Mula-Mutha River at Pune, Maharashtra (India)

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Abstract

Water is one of the most important compounds in the world. The contamination and pollution of water is of great concern in the world for the developing countries like India. The question of water pollution has acquired a critical stage. Human activities, industries, hospitals, sewage water, agricultural diffused pollution are some of the sources of water pollution. Drinking water quality is one of the important environmental health detriments. Use of safe drinking water is a foundation for the control and prevention of water born diseases. In this work we have analyzed Mula-Mutha river water quality for drinking purpose. Various river water parameters were analyzed and are compared to established standards given by WHO. The river water analysis showed that the river water is not suitable for potable use in city area.

Keywords: Mula-Mutha River, Pune City, Physico-chemical analysis, Water pollution

INTRODUCTION

The entire Pune City is covered by Mula-Mutha rivers. River Mula originates from Mulshi Dam which forms Mulshi Lake. River Mutha originates from Panshet Dam Via Khadakwasla Dam. It also flows through city of Pune and meets to river Mula at Shivajinagar area of Pune city, to that part it called as Sangam Bridge. After the merging with Mula river in Pune city it flows as the Mula-Mutha river in city area. At the initial journey of both the rivers the river water was used for agriculture, irrigation

and domestic use only. In those days river water was the only source of water for the residents staying on the bank of river. But due to rapid industrialization and civilization the priority of river was changed along with the initial uses of river water the river was used as a dumping ground to through the unwanted things and disposal of sewage wastes in to the river body. Hence, due to mixing of unwanted materials in to the water body, the river now looks like canal carrying waste water towards the purification unit, basically in the summer season this type of scene was observed. In the form of agricultural run-off a large quantities of fertilizers and pesticides are discharged in to the river water[6].

Generally, fresh water is a good resource which is required for human existence, agricultural as well as industry[7]. For the proper development fresh water is one of the essential parameter now days. As per the literature survey in our country near about 70% of the surface water becomes polluted due to discharge of sewage and various types of effluents in to the river body.[12] We are well-known that human life and water quality are interrelated with each other. To the ecosystem water is one of the most important compounds [10]. Because of human activities water gets polluted. By studying physical, chemical and biological parameters of water one can get idea of water quality. Hence, it is essential to observe the quality of drinking water at regular time interval.

Some of the authors have done Mula –Mutha river water analysis, these are like:

Pali Sahu, Sonali Karad and et.al 2015 studied the Mula –Mutha river for the physico-chemical parameters. The study was done for pH, total hardness, DO, BOD, COD. In the conclusion they said that due to domestic sewage and industrial effluents the river water quality is deteriorated totally which shows the increasing load of pollution.

A.B.More, C.S.Chavan and et.al studied the Mula-Mutha river in the year 2014. As per analysis it was observed that due to agricultural run-off through non point sources the river Mula was polluted. Also due to addition of domestic sewage and industrial effluents river Mutha was polluted. And, hence after merging with each other, both the rivers are polluted.

Vinaya Fadtare and T T Mane studied Mula –Mutha river in the year 2007 for the physico-chemical parameters. As per result analysis it was found that before entry point in the city area the river water was safe for drinking and other applications but after entering the city areas due to mixing of pollutants in to the river water, the DO level get decreased and after mixing of organic load other parameters like sodium, chlorides, nitrates, sulphates, TDS are also increased.

EXPERIMENTAL

MATERIALS AND METHODS

While do this analysis work, firstly the background of the Mula-Mutha river was studied. After that sampling stations were selected on the basis of pollution load. It may be point source or non-point source. This will help for the better analysis. After

that water samples were collected in clean polythene bottles of 1 liter capacity in the year 2019. The collected water samples were analyzed for various river water parameters like Temperature, pH, DO, BOD, COD, Chloride, Nitrate, Sulphate, Calcium, Magnesium and Hardness. The analysis was done by following the standard procedures given by APHA(1992) and Trivedy R. K. (1987)

Observation Table No.1:

Parameters studied and methods used with Indian Standards.

Sr.No.	Parameters	Method Applied	Indian Standard
1	pH	Electrometric Method	6.5-8.5
2	DO (mg/L)	Azide modification	7.6-7.0
3	BOD (mg/L)	Azide modification	30
4	COD (mg/L)	Dichromate reflux	250
5	Chlorides (mg/L)	Argentometric TTitrimetric method	250
6	Sulphates (mg/L)	Colorimetric Turbidimetric method	200
7	Nitrates (mg/L)	Colorimetric Turbidimetric method	45
8	Calcium (mg/L)	EDTA Titration Method	75
9	Magnesium (mg/L)	EDTA Titration Method	30
10	Hardness (mg/L)	EDTA Titration Method	300

Observation Table No.2

Parameters	Sampling Station 1	Sampling Station 2	Sampling Station 3	Sampling Station 4	Sampling Station 5	Sampling Station 6	Sampling Station 7
pH	6.8	7.1	6.24	6.62	5.76	6.71	7.76
DO	3.6	4.8	4.9	3.1	3.4	3.0	2.8
BOD	9.5	131	136	128	168	173	166
COD	12.48	386	298	281	388	391	403
Chloride	32	168	264	258	271	283	291
Nitrate	13	24	30	31	34	39	41
Sulphate	6	8	11.3	10.3	11.8	12.3	12.4
Calcium	7	32	41	47	49	53	48
Magnesium	2	5	9	12	11	16	18
Hardness	29	113	123	141	148	153	152

Graphical Presentation of all the parameters

Mixing of sewage water in to the river body



Garbage and other impurities



RESULTS AND DISCUSSION

By studying the river water quality for these ten parameters it is observed that, pH of the river water is in the range from 5.76 to 7.76. It shows that at sampling station no. 5 the river water is below the Indian standards i.e. acidic in nature. Generally, in natural water pH range is in between 6.00 to 8.00[8]. This is an important term as far as solubility point is concerned. At sampling station no. 7 the observed pH is 7.76, this higher value suggests the mixing of domestic load in to the river water body. In the given water sample, the observed range of DO was in between 2.8 mg/L to 4.9 mg/L. As per Indian standards the desirable limit of DO is 7.6 -7.00 mg/L. But in our case

DO level is below the Indian standards[14], it may be due to the utilization of oxygen which is available in the water body by the bacteria. BOD is nothing but the amount of oxygen which is required for the decomposition of organic matter. Here, the observed values are in the range from 9.5 mg/L to 173 mg/L. Hence, it is proved that in the river water course at the initial stage the BOD level is within the Indian standards, But when it enters the city of Pune and after the mixing the various types of pollutants in to the river water DO level is getting decreased and BOD is increased. It shows that the possibility of mixing of organic load in to the river water[17,18]. The amount of COD observed was in the range from 12.48 mg/L to 403 mg/L in the study area, which is beyond the permissible limit i.e. 250 mg/L given by Indian standards. With the help of COD test one can find out the amount of organic materials in the river water [5]. Here observed values of COD shows that the pollution level is at increased level[3]. Chloride concentration was observed in the range from 32.00 mg/L to 291 mg/L in the study area. Here, the increased values of chloride may be due to use of water for washing clothes, mixing of sewage water in to the river water i.e. due to community activity[14]. Amount of chloride concentration proves the river water is polluted[15]. Generally, chloride gets associated with Ca, Mg or Na as CaCl_2 , MgCl_2 or NaCl , hence chloride remains for longer time in the water body in a combined form. Nitrate concentration was recorded in the range of 13mg/L to 41 mg/L. Observed nitrate concentration is within the standard limit. i.e. 45 mg/L given by Indian standards. High amount of nitrogen is observed in the domestic sewage [16]. Amount of sulphate concentration observed was in the range from 6.00 mg/L to 12.4 mg/L. Here, the observed amount of sulphate doesn't exceed the permissible limit given by Indian standards. Normally, Calcium along with Magnesium is responsible for hardness. But for cellular functions in plant tissues calcium is one of the important component, which also works as a nutrient[4]. Here observed values are 7.00 mg/L and 53 mg/L for the given sampling stations. This is within the standard limit given by Indian standards. Magnesium concentration observed was in the range from 2.00 mg/L to 18 mg/L. Hardness is nothing but the combined effect of all the parameters/minerals which are dissolved in the water body i. e. salts like calcium and magnesium. Depending on hardness of water it is decided that the water is suitable for domestic use or not. Hardness was observed in the range from 29.00 mg/L to 153 mg/L, higher values of hardness were found may be due to mixing of sewage water and industrial effluents in to the river water [9]. It's also within the limit of Indian standards. i.e 300 mg/L.

CONCLUSION

By studying the river water analysis it is observed that the river water is suitable for all the applications at the initial stage only i.e. at the first sampling station only. But when it enters the city of Pune due to mixing of sewage water and industrial effluents and agricultural run - off the river water is deteriorated. Hence, water is not suitable for any domestic or other uses. To stop the pollution level initially mixing of sewage water should be stopped and river water should be monitored continuously.

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