

Analysis of Some Physico-Chemical Parameters of Mula-Mutha River at Pune, (Maharashtra) A Case Study

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Abstract- Physico-chemical characteristics of Mula-Mutha River water were studied in the three stages viz. Pre-Monsoon, Monsoon and Post-Monsoon in the year 2016. The analysis was done for the parameters like pH, DO, BOD, COD, Chloride, Nitrate, Sulphate, Turbidity, Calcium, Magnesium and Hardness etc. The results were compared with the drinking water standards of WHO and ISI (10500-91) which indicate towards the deterioration of quality of water body after mixing the sewage water in to the main course of the water body. The study indicates the need for monitoring of river water for physico-chemical characteristics in study area. The study emphasizes on the detrimental impact caused by the sewage water on Mula-Mutha River.

Index Terms- Water pollution; pH; Dissolved oxygen; Hardness; Mula-Mutha River.

1. INTRODUCTION

Water is an important and most abundant substance. All animals and plants possess water as an essential constituent¹. It is widely available in air as water vapour and can be obtained from variety of sources. Some common sources of water are river, lake, sea and well etc. The purest form of water is probably the rain water, because it is obtained from the evaporation of water from natural resources leaving behind many impurities². Water is used for industrial purposes and for municipal supply. To ensure the right quality and quantity of water for these purposes it is necessary to study water quality. Water has a unique ability to dissolve any soluble matter that comes in contact with it. Any particular use will have certain requirements for the physical, chemical or biological characteristics of water³. Quantity and quality demands of different users will not always be compatible, and the activities of one user may restrict the activities of another, either by demanding water of a quality outside the range required by the other user or by lowering quality during use of the water. Efforts to improve or maintain a certain water quality often compromise between the quality and quantity demands of different users⁴.

Table 1: SAMPLING STATIONS

Sr.No.	Name of the sampling station
S ₁	Kharakwasla (Mutha river)
S ₂	Vitthalwadi (Mutha river)
S ₃	Garware Causeway(Mutha river)
S ₄	Holkar Bridge (Mula river)
S ₅	Wakad Causeway (Mula river)
S ₆	Bund Garden (Mula-Mutha river)

Table 2: Physico-chemical characteristics of Mula-Mutha river [Pre Monsoon Season (Summer)]

Sr. No.	Parameter	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆
1	pH	8.40	6.77	7.64	6.68	5.98	5.67
2	DO	5.8	3.4	1.98	1.36	1.28	1.23
3	BOD	9.5	28	31	51	56	54
4	COD	44	39	42	58	63	59
5	Chloride	36	54	62	75	81	78
6	Nitrate	19	26	29	36	34	39
7	Sulphate	17	23	29	33	31	29
8	Turbidity	03	21	11	09	13	17
9	Calcium	29	31	35	39	42	41
10	Magnesium	13	29	32	37	33	34
11	Hardness	30.12	83.96	112.64	77.76	74	79

Table 3: Physico-chemical characteristics of Mula-Mutha river [Monsoon Season]

Sr. No.	Parameter	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆
1	pH	7.80	5.34	5.68	5.71	5.63	5.08
2	DO	6.2	2.52	3.17	2.09	3.02	3.84
3	BOD	10	32	46	59	78	61
4	COD	48	53	52	62.5	69	67
5	Hardness	79	124	121	138	143	140
6	Chloride	53.40	51.34	83.20	53.1	52.40	51.42
7	Nitrate	21	23	27	32	35	33
8	Sulphate	20.31	19.66	16.69	31.63	21.08	36.09
9	Turbidity	04	17	19	14	18	17.05
10	Calcium	31.	35.	38.	33.	34.	36.

		82	48	66	53	40	09
11	Magnesium	13.89	32.05	30.21	33.01	27.6	29.3

Table 4: Physico-chemical characteristics of Mula-Mutha river in Post Monsoon Season (Winter)

Sr. No.	Parameter	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆
1	pH	7.48	8.72	7.37	6.56	6.78	6.98
2	DO	6.1	0.7	0.6	0.3	2.1	2.3
3	BOD	08	42	39	42	47	41
4	COD	40	45	58	73	71	74
5	Chloride	56	59	63	75	79	84
6	Nitrate	13	12	17	19	18	20
7	Sulphate	14	19	18	13	17	19
8	Turbidity	06	14	15	09	11	09
9	Calcium	61	67	73	79	81	79
10	Magnesium	11	17	16	19	15	14
11	Hardness	30.16	102.44	104.68	124.04	131	127

2. RESULTS AND DISCUSSION

The data of physico-chemical parameters of Mula-Mutha river for the year 2015-16 is presented in the table No 2, 3, 4. The pH of the river water in the present investigation was observed in the range from 5.34 to 8.72, which shows slight alkalinity at Vittalwadi sampling station. DO is the most important parameters in assessing water quality and reflects the physical and biological processes, prevailing in the water^{5to7}. A good water should have the solubility of Oxygen. 7.6 and 7.0 mg/L at 30°C and 35°C respectively.

In the absence of sufficient amount of dissolved oxygen in water, the anaerobic degradation of the pollutants makes the water foul smelling. Dissolved Oxygen in water is necessary for aerobic biological activities⁸. The D.O. of the river water in the present investigation was observed in the range

from 0.3 to 6.2 mg/l. Basically BOD is directly related to the extent of pollution of waste water, sewage and industrial effluents. More the BOD of sample more will be pollution caused by it. BOD is a measure of the amount of oxygen required for the Biological Oxidation of the organic matter under aerobic conditions at 20 °C and for a period of 5 Days^{9to11}. Here observed values are in the range of 08 to 78 mg/l.

COD is a measure of both the biologically oxidisable and biologically inert organic matter present in the sewage sample¹². It is an important and quickly measured parameter for steam and industrial waste water analysis and water treatment plant¹³. Observed values of C.O.D. are in the range of 39 to 74 mg/l. The chloride and sulphate of this river water were not high. The amounts of chloride found in the sample did not exceed the maximum permissible limit i.e. 500 mg/L for drinking water prescribed by WHO¹⁴. The presence of sulphate has less effect on the taste of water compared to the presence of chloride. Sulphate occurs naturally in water as a result of leaching from gypsum and other common minerals. Discharge of industrial wastes and domestic sewage tends to increase its concentration¹⁶. The sulphate concentration varied between 13 mg/l to 36 mg/l and found within the prescribed limit. The desirable limit of sulphate in drinking water prescribed by ICMR is 200-400 mg/L. Chloride found in the range of BIS. The values are from 36 to 84 mg/l. Nitrate concentration depends on the activity of nitrifying bacteria which in turn get influenced by presence of dissolved oxygen¹⁵. In the present study the values of nitrate ranged from 12 to 39 mg/l, which is below desirable range of BIS. The total hardness found is in the range of BIS standard at near about all stations. The values of hardness are found to be 30.12 to 143 mg/l. Nitrate in water is due to domestic activities and agricultural runoff which dissolved in rain water leaches into the wells¹⁷. The presence of nitrate in drinking water has adverse effects on health above 50 mg/l. The nitrate content in the study area varied in the range 12 mg/l to 39 mg/l and found below permissible limit. Other parameters like Turbidity, Calcium and Magnesium are within the prescribed limit

3. CONCLUSION

Water is indispensable not only for the existence of the mankind but also for human development and healthy functioning of eco-system. It is concluded from the present study that the pH values exceeds the desirable range as per BIS, means it make water alkaline. Dissolved oxygen found very less as

recommended by ICMR standards and the values of Biochemical oxygen demand (BOD) are found higher, in the observed water samples. As DO decreases BOD increases. All locations need proper treatment for water to use, the water effectively without any pollution inserted from outsource. If some precautions will be taken for the river water then it can be used for domestic and irrigation purpose as well as for aquatic life.

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