Water Quality Analysis of Muttar River

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Abstract
The Muttar River is an extremely polluted fresh water source with degrading water quality and flow. The river has a twelve kilometer length and an average width of fifty meters. According to the industrial population in its neighbourhood, the river is segmented into three zones of about approximately four kilometer stretches. Water sample collection was carried out from each zone by choosing certain sampling points according to the physical accessibility. Thereby, for water quality analysis of the river, several water quality tests such as turbidity, BOD, COD, MPN, DO and hardness were done and the results in each season found and plotted graphically with the standard permissible limits.
Keywords: *River pollution, industrial effluents, river segmentation, water quality tests.*

Introduction

Water is one of the most important requirement in our day to day life. It is used for several purposes that are industrial, domestic and commercial. About 97% of the earth's crust is covered with water where only 2.5% serve as freshwater sources. The rest exists in the form of glaciers, polar ice caps, icebergs etc.

Almost 96.5% of the water is found in seas as well as rivers, where the 1.7% of the water is groundwater and less than 0.3% is the freshwater found in rivers and lakes.

India has seven major rivers running through various states. Within the twenty nine states, Kerala is one amongst them to have around forty four rivers. However, this has come to one's notice that there are several rivers which are in their dying state and has an accelerated growth of pollution making it to ebb away slowly. Water scarcity and pollution are the few amongst the major causes that is making our rivers die. Accelerated growth of algae and hyacinths are due to the excessive chemicals present within the water making it unsuitable for domestic purposes.

Water on the Earth moves continuously with the help of water cycles which are evaporation and transpiration which further combines into evapo-transpiration, condensation, precipitation and runoff reaches eventually at the sea. Large amounts of water are also chemically combined or adsorbed in hydrated minerals. Water is an excellent solvent within the wide variety of chemical substances which dominates in the industrial purpose as well as domestic purpose such as cooking, cleaning etc.

The magnanimity of this situation should be unfolded and the works must be diligently done in order to curb the water pollution scenario.

Muttar River

Industrial growth is one of the main factors that contribute to this alarming water pollution. Most of the industries have their effluents flowing into the adjacent rivers without much treatment. And one such severely polluted and dying river in our locality is the Muttar river. It has a big collection of industries in its neighbourhood and the major danger is that the river connects the Periyar river at its mouth as well as at its end. And so, there is high

contribution to the pollution caused on Periyar river by its tributary, Muttar river. The Muttar River originating from Cheranalloor is so, taken up as the water body that has to be treated and purified. The river stretches for a total length of twelve kilometers with the width varying being different at each area with an average of fifty meters. The condition of the river is so hoarse and yet severe that it is under heavy influence of pollution due to the dumping of wastes from industries, homes etc. Due to this matter, there is almost no sustaining aquatic life in the waters because all the dumping of waste and pollution causes the marine life to ebb away at a very rapid rate.

Objectives
To conduct the water quality analysis.

Water Quality Analysis
There are many useful tests available to determine the health, safety and performance of the water sample depending upon the type of use as well as location. All these tests are mainly done to make sure the water body is suitable for drinking or any other domestic purposes or not. The testing shall interpret the quality of water from the particular area and to understand whether the quality of water has been changed over time.

River Segmentation
The river has numerous industries in its neighbourhood among which most of them discharge the industrial effluents into the river without much treatment. The industrial population in the area included chemical, medical as well as food industries. The colour coding of these industries is shown in figure 1.1.

Fig.1.1 Colour classification of the industrial accumulation near the river

According to this, the twelve kilometre long river was segmented into three zones. The first zone lies mainly is Cheranalloor region, the second in Manjummel and the third in Kalamassery.

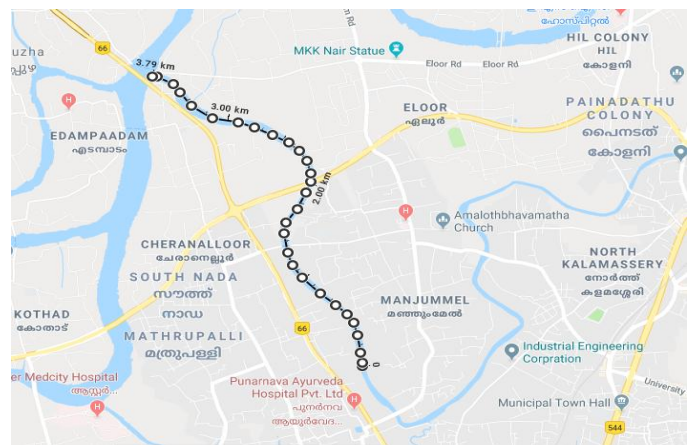The segmentation is shown in figures 1.2,1.3 and 1.4.
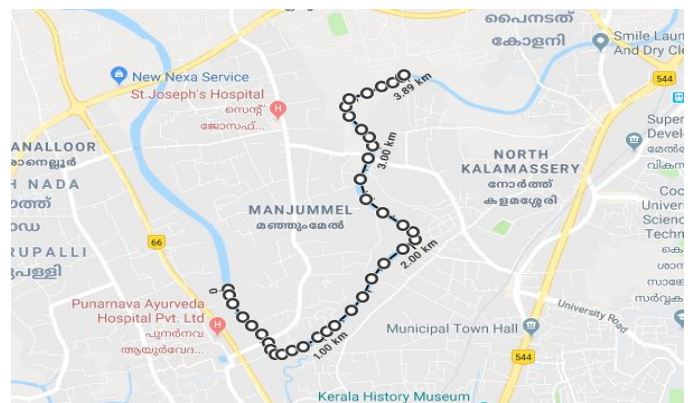

Fig.1.2 Zone 1 of Muttar river
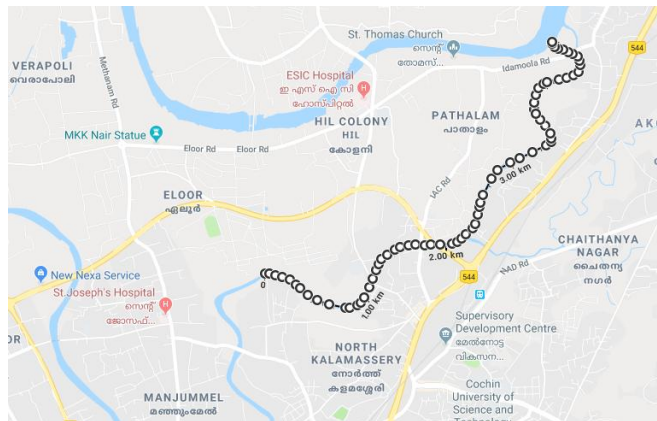

Fig.1.3 Zone 2 of Muttar river

Fig.1.4 Zone 3 of Muttar river

Sampling points were chosen from each zone by finding out physically accessible points for water sample collection. And water samples were collected in three weather conditions, namely winter, humid and summer.

Water Quality Studies

The water was collected from the respective sampling points and was tested. The following were the experiments conducted on the sample.
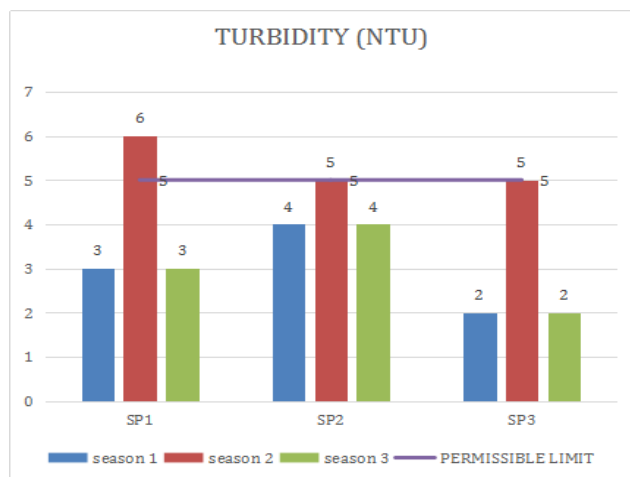
Physical Test: Turbidity

Chemical Tests: DO, Hardness, pH, BOD, COD

Biological Test: Most Probable Number for E. Coli Bacteria

Water Quality Test Results

Table 2.3.1 Result for Turbidity

| Turbidity (NTU)	Season 1 (Winter)	Season 2 (Humid)	Season 3 (Summer)
Sp1	3	6	3
Sp2	4	5	4
Sp3	2	5	2

Inference

As per IS 10500-1991, the permissible value of turbidity in water is supposed to be 5NTU. As there was a variation in the seasons, the turbidity varied along. For the humid season it is shown that the turbidity is high in all the sampling points, making it unsuitable for drinking.

Table 2.3.2 Result for Hardness

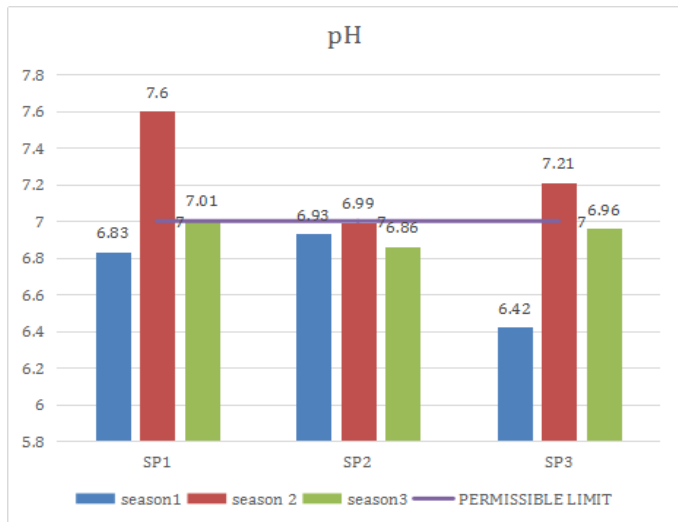| Hardness (mg/l)	Season 1 (Winter)	Season 2 (Humid)	Season 3 (Summer)
Sp1	660	496	580
Sp2	36	396	360
Sp3	20	24	40
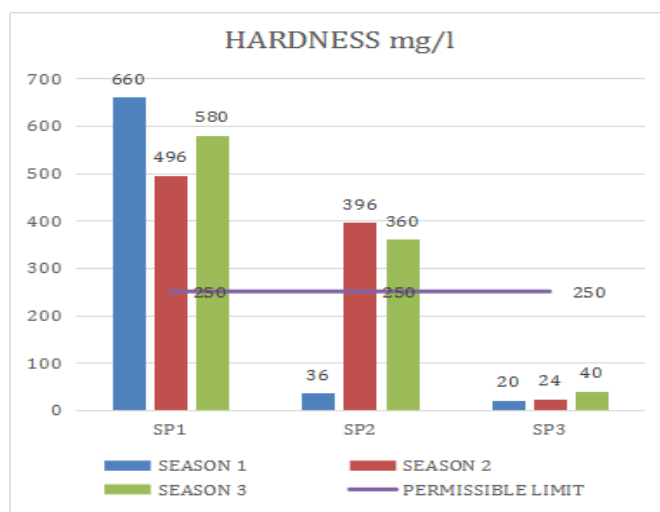
Inference

As per IS 10500-1991, the permissible limit of hardness is 250 mg/l. Sample 1 indicated the most hardness amongst the three. But as the season varied we can see that the values have changed for sample two. Indicating that sample three is the only satisfactory for drinking purpose.

Table 2.3.3 Result for pH

| pH	Season 1 (Winter)	Season 2 (Humid)	Season 3 (Summer)
Sp1	6.83	7.60	7.01
Sp2	6.93	6.99	6.86
Sp3	6.42	7.21	6.96

Inference

As per IS 10500-1991, the permissible limit for the pH of water is 7. Sample point 1 showed a trace of mild alkalinity making it unsuitable for drinking. There is no direct variation to the pH and season.

Table 2.3.4 Result for DO

| DO (mg/l)	Season 1 (Winter)	Season 2 (Humid)	Season 3 (Summer)
Sp1	1.2	1	2
Sp2	2.2	2.4	2.1
Sp3	2.7	3	2.6
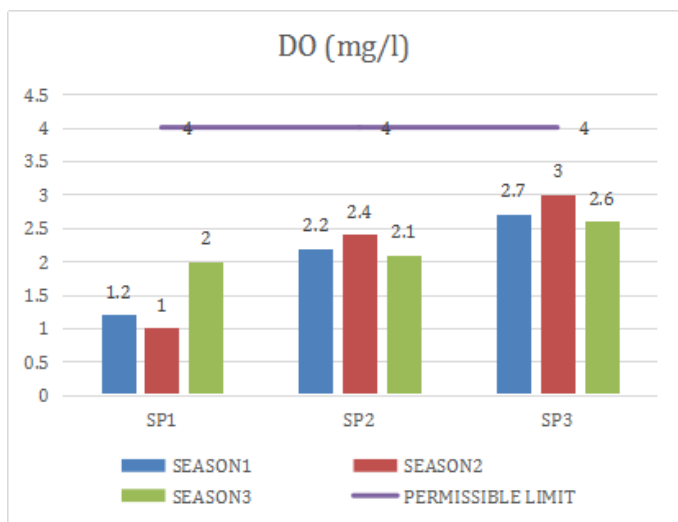
Inference

As per IS 10500-1991, Permissible value of DO shall be 4 mg/l. The value of DO is seen to be maximum in sampling point 3. Since, none of the sampling points have shown an acceleration to the border line. Making all of them unfit and unsuitable domestic as well as drinking purposes.

Table 2.3.5 Result for BOD

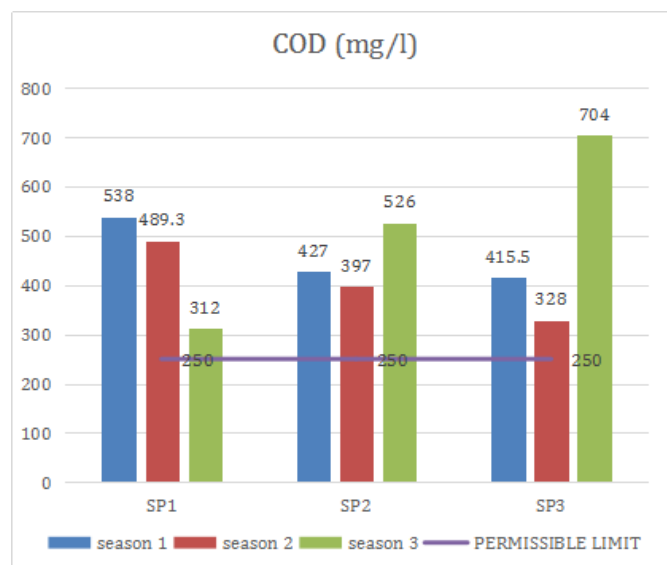| BOD(mg/l)	Season 1 (Winter)	Season 2 (Humid)	Season 3 (Summer)
Sp1	0.25	0.28	0.36
Sp2	1.1	1	1.5
Sp3	1	1	1.2
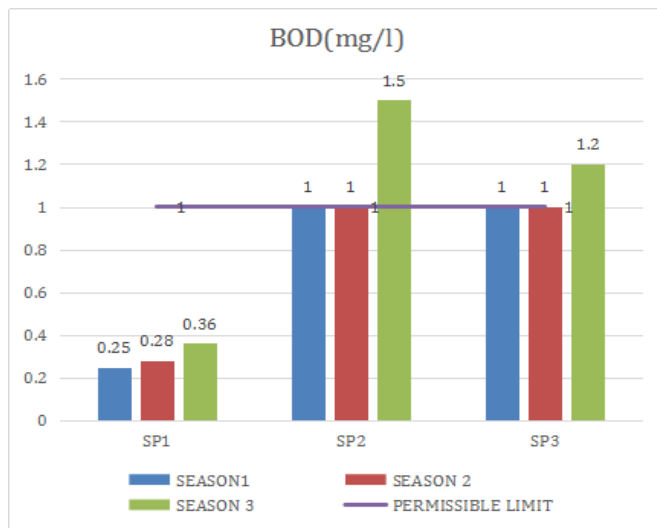
Inference

As per IS 10500-1991, the permissible limit of BOD is 1 mg/l. There is a hike in the BOD with reference to the seasons. As some values remain on the borderline and some have exceed beyond the limits. Those which have exceed beyond the limits are no longer fit for drinking.

Table 2.3.6 Result for COD

COD(mg/l)	Season 1 (Winter)	Season 2 (Humid)	Season 3 (Summer)
Sp1	538	489.3	312
Sp2	427	397	526
Sp3	415.5	328	704

Inference

As per IS 10500-1991, the permissible limit of COD is 250 mg/l. All the values have a hike beyond its limit making it unsuitable for drinking. Sample point 3 had the largest amount of COD presence.

Table 1.7 Result for MPN

MPN index/100ml	Season 1 (Winter)	Season 2 (Humid)	Season 3 (Summer)
Sp1	12	>23	16.1
Sp2	16.1	>23	23
Sp3	>23	>23	>23

Inference

As per IS 10500-1991, the permissible limit of MPN is 0. There should not be any sort of microbe present if used for domestic purpose. The table indicates that there is a large amount of microbes present, which could be either pathogenic or non. Which makes it unsuitable for drinking.

Conclusions

The water quality tests were conducted for the water sample according to seasons. The results indicated that the water quality indices were beyond the permissible limit which proves that it is entirely unfit for drinking. Therefore, it is mandatory to design a purification so that the water can be made fit for drinking as well as for domestic purposes in case if the residents residing in the area experience some sort of shortage. Furthermore, the water from the river after purification can be used by the industries as well.

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