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WATER QUALITY INDEX OF RIVER NOYYAL AT TIRUPUR, TAMIL NADU, INDIA

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ABSTRACT

The study on some physico-chemical and biological characteristics of Noyyal river at Tirupur, Coimbatore district was carried out. The sampling points were selected on the basis of their importance. Most of the drainage system of Tirupur carrying dyeing waste, industrial effluents and sewage, are allowed to mix with river water in and around the city. Water Quality Index (WQI) for Noyyal river at its source and before and after Tirupur has been calculated. For surface water, determination of water quality index becomes essential and prerequisite. Water quality index provides a system for rating water quality in terms of index numbers that offer promise as a useful tool in the administration of water pollution abatement.

INTRODUCTION

River Noyyal is a seasonal river originating from Bolampatti valley of Velliangiri Hills in the Western Ghats passing through Coimbatore, Tirupur, Kasipalayam, Palayamkottai and parts of Erode before joining the River Cauvery near Kodumudi after traveling 158.50 km.

The discharge in the river varies with seasons. In monsoon the river is flooded while in summer it is reduced to small pools and puddles. However, in recent years, with the advent of Tirupur as an industrial city, the river has started flowing almost full with the effluents.

Tirupur has about 3000 units of hosiery and knitwear. These units are spread over about 30 sq. km of town, near to Noyyal river. Out of the 3000 units about 750 are engaged in dying and bleaching work. It is estimated that when these units function to full capacity about 1,00,000 m^3 of water is required per day. The effluents approximately 75,000 m^3 are discharged into the River Noyyal and into various sewage systems (Senthil Nathan & Azeez 1999).

Noyyal river and its connected tanks are the main source of water, which provide drinking water and water for agriculture in Coimbatore, Erode and parts of Karur region. But nowadays it has been polluted due to different reasons such as discharge of industrial waste, sewage, and dyeing and bleaching effluents.

The present study has been carried out to evaluate the water quality characteristics of Noyyal river at Tirupur by using Water Quality Index (WQI) method which enables the common man to understand the quality of water.

MATERIALS AND METHODS

The water samples from Noyyal river were collected from three stations, one at its source and the other two are before and after Tirupur (Mangalam & Kasipalayam). Two seasonal periods, one of low flow during summer and second of high flow during rainy season, in the year 2004 were selected. The

samples were collected from all the stations at 10 a.m. in both the seasons. For chemical, biological and microbiological examination, different methods of collection and handling were adopted following the standard procedures (APHA 1992). The instruments were used of precise accuracy and chemicals used were of AR grade. The parameters and methods selected for the above examination of water are detailed in Table 1. Water Quality Index has been calculated for the water samples collected on the basis of the results of chemical analysis.

RESULTS AND DISCUSSION

The physico-chemical and biological characteristics of the samples are given in Tables 2 and 3 along with the respective WQI value. The water quality index was calculated by using the eight parameters (Magudeswaran 2004).

The eight resulting values were then added to arrive at an overall WQI (Magudeswaran 2004).

WQI = 0.19 DO + 0.18 F.C. + 0.12 pH + 0.12 BOD + 0.11 Total phosphate + 0.11 Nitrates + 0.09 Turbidity + 0.08 Total solids.

Dissolved oxygen plays an important role in water quality determination. The introduction of oxygen demanding materials, either organic or inorganic, into a river causes depletion of the dissolved oxygen in the water. This poses a threat to fish and other higher forms of aquatic life if the concentration of oxygen falls below critical point. There exists no better general indicator of water quality level than DO (Huge Ellis 1987).

It was found that the DO of river water was maximum at station 1 and less at station 2 and least at station 3. The DO % saturation of the river water at stations 1, 2 and 3 are 95.5, 78.0 and 35.0 (Table 2) respectively for rainy season and 96.5, 80.0 and 23.5 (Table 3) for summer season.

Both in summer and rainy season, the DO percent saturation was low at station 3. This is due to the addition of bleaching and dyeing effluents containing oxidisable organic matter and consequent biodegradation and decay of vegetation, which leads to consumption of oxygen present in water (Jammel 1998). Low % saturation of DO has direct effect to fish community, especially during the spawning period because the respiratory system requires DO to breath.

The pH of water varied from 6.8 to 10 showing that the alkalinity of water has increased. The total solids are important parameter for drinking water and to be used for other purposes. The permissible limit of total solids for drinking water is 1500 mg/L, but the value of Noyyal river water after Tirupur exceeds this value. Gupta & Singh (2000) also reported high concentration of TS in Damodar river due to mixing of sewage and industrial wastes.

BOD was low at station 1 and higher at station 3. The faecal coliforms reach as high a value of 700/100mL MPN and BOD the value of 44 ppm in this stretch of Noyyal river. Had there been a biochemical units situated in this area the BOD could have increased to a still higher value as pointed out by Palupi et al. (1995), but no such unit is present in this stretch. The higher value of BOD is due to organic waste from dyeing units. The other parameters like pH, TDS and turbidity also show the same trend. Faecal coliforms are around 3 MPN/100mL at source, starts to rise and reaches the value of about 700 MPN/100mL at Kasipalayam at station 3. The rising of faecal coliform is the direct evidence for mixing of sewage into the river water.

The higher values of COD were observed at station 3 for both the seasons (Tables 2, 3), which were due to the discharge of untreated and partially treated effluents having high load of organic

Table 1: Parameters and methods for water examination.

S.No.	Parameters of water analysis	Methods
1	DO ppm	Winkler's titrimetric method
2	Faecal Coliform MPN/100mL	Multiple tube fermentation method
3	pH in standard units	Electrometric method
4	BOD in mg/L	Oxygen difference method
5	Phosphate in mg/L	Stannous chloride method
6	Nitrates in mg/L	Brucine sulphate method
7	Total solids in mg/L	Gravimetric method
8	Turbidity in NTU	Nephelometric method
9	COD in mg/L	Dichromate reflex method
10	Chloride in mg/L	Argentometric method
11	Alkalinity in mg/L	Acid titration method

Table 2: Physico-chemical characteristics of the Noyyal river (rainy season).

S.No.	Test parameter	Source	Mangalam	Kasipalayam
1	DO, % saturation	95.5	78.0	35.00
2	Faecal coliform MPN/100mL	2.0	200	600
3	pH	6.8	7.5	8.5
4	BOD in mg/L	1.0	10.5	20
5	Phosphate in mg/L	0.5	1.6	3.9
6	Nitrates in mg/L	0.25	2.5	6.0
7	Total solids in mg/L	150	325	2000
8	Turbidity in NTU	3.0	7.5	10.0
9	COD in mg/L	2.5	90	620
10	Chloride in mg/L	3.5	146.99	405.99
11	Alkalinity in mg/L	12	230	444.0
12	Water Quality Index	94.5	66.4	37.4

Table 3: Physico-chemical characteristics of the Noyyal river (summer season).

S.No.	Test parameter /unit	Source	Mangalam	Kasipalayam
1	DO, % saturation	96.5	80.0	23.5
2	Faecal coliform MPN/100mL	5.0	500	700
3	pH	6.9	8.0	10.0
4	BOD in mg/L	0.5	17.0	44.0
5	Phosphate in mg/L	0.25	2.2	5.0
6	Nitrates in mg/L	0.20	9.50	17.0
7	Total solids in mg/L	100	1100	3000
8	Turbitity in NTU	1.75	15.0	17
9	COD in mg/L	3.0	21	257
10	Chloride in mg/L	6.0	160	544
11	Alkalinity in mg/L	20	50	251
12	Water Quality Index	95.0	53.2	29.2

matter into the river. The chloride content at station 3 of Noyyal river water exceeded the maximum permissible limit, i.e., 500 ppm for drinking water prescribed by WHO (1985).

The WQ index value has decreased from station 1 to 2 by about 30 units (95 to65) in rainy season and by about 40 units (95 to 53) in summer season.

The WQI value from station 2, Mangalam to station 3, Kasipalyaam has decreased from 66 to 37 in rainy season and 54 to 29 in summer season. According to WQI legend the water which has the quality characteristics value around 25 is very bad and can be used for no purpose (Brown et al. 1970). This sorry state of affair for the Noyyal river within 15 km stretch (Tirupur region) out of its 158 km journey has to be viewed very seriously.

CONCLUSION

Noyyal river runs all across the Tirupur town, virtually dividing it into two halves. In this stretch the decrease in WQI values and various quality characteristics are very high and clearly indicate that the presence of textile mills in and around Tirupur has a strong impact on the Noyyal river water. The good news is that the legal authorities have taken few steps to reduce pollution from dyeing and bleaching units.

At the same time, Tirupur city does not have underground drainage system. The sewage from many parts of Tirupur, discharged in the surrounding areas, unfortunately gets into the Noyyal river. The quantity of such sewage addition into the river has grown over the years, especially due to the 50% growth in population in the past 10 years. The State government and the local municipal authorities have to take more steps to cope up with this dynamic growth, which is again responsible for the decrease in WQI of Noyyal river.

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