

ORIGINAL ARTICLE

Study of Physico-chemical Characteristics of Water Quality of Yamuna River at Mathura, UP

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ABSTRACT

A study was conducted to examine physico-chemical properties of Yamuna water in Mathura City. Monitoring was done during pre-monsoon near the Mathura City in sampling point viz Mashani Nala, Vishram Ghat, Railway Bridge, Laxmi Nagar, Bangali Ghat. The parameter examined were pH, electric conductivity, TDS, alkalinity, total hardness, chloride, nitrate, COD, BOD, DO, calcium and magnesium at five sampling sites. The results showed that water quality at these sites was not in permissible limits. Mashani Nala, Railway Bridge and Bangali Ghats were highly contaminated.

Keywords: Water Quality, Yamuna, Mathura

Received 01.06.2013 Accepted 01.09.2013

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INTRODUCTION

Water is most vital component on planet earth and essential for all types of life process in plants, animal including human beings. It is considered as plentiful and in expensive natural resources since prehistoric period. The main sources of water in nature are surface and ground water. The quality of various water systems depends on the presence of inorganic and organic ingredients dissolved and suspended form and their balance is essential to maintain the water quality. Almost 75% of the water in India has become polluted due to discharge of domestic sewage municipal waste drains, urban agricultural waste, large scale of industrial effluents [1,2]. The important management of water system may cause serious problem in availability and quality of water [3-6]. Since river are a major source of water and their water need to be maintained for water to be described as potable [7-11]. It has to be complete with certain physico chemical standard which are designated to ensure that the water is safe for drinking¹⁹⁻²⁰. Mathura situated on the right banks of the Yamuna River about 145 KMS-South-East of Delhi and 58 Kms North West of Agra, Mathura is rapidly emerging as a leading Industrial and commercial city the number of industries in the city limits Have Increased to 180 consisting of Sari Printing dyes, chemical, Nickel and silver polishing, electroplating supari, Industry milk processing, crude oil, sugar etc. the developments of city has caused directly a number of water quality problems [12-15].

MATERIAL AND METHODS

Water sample were collected from 5 sites during pre monsoon period (April-May) in the year 2013 and analyzed for different physico-chemical parameters. The samples were collected in polythene container of 2 liter capacity from a site in morning hours between 8 am to 10 am and were analyzed following standard methods¹⁶ The results were also compared with the Indian Standards.

RESULT AND DISCUSSIONS

The various Physico-Chemical parameters of river water are presented in the Table-1.

pH values (7.0 to 8.10) of all sites were closed to recommended value (6.8-8.5) of water for drinking purpose. With the exception site-1 (Mashani Nala) having a little higher pH value (slight alkaline). It was noticed that the PH value of the water appears to be dependent upon the relative quantities of calcium, carbonates and bicarbonates. The water trends to be more alkaline when it possessed carbonates [17-18]. Electrical conductivity values closely correlated with content of total dissolved solids. EC values were as per US guide lines for potable water and irrigation water and were less than 0.7 ds/m. The water sample having 0.7-3.0 ds/m values of EC are considered as moderately contaminated and those with EC higher than 3.0 ds/m are regarded as severally contaminated water it higher values were recorded at site-1

(Mashani Nala 2.965). In the present study, the EC value falls in the moderate contaminated category. Similar observations were observed by Krishna Murthy and Bharti [16] for Kalu river in North Karnataka.

Table – 1: Physico-Chemical Characteristics of Yamuna River at Mathura Pre-Monsoon 2013

S.No.	Parameters	Mashani Nala Site-1	Vishram Ghat Site-2	Railway Bridge Site-3	Bangali Ghat Site-4	Laxmi Nagar Site-5
1	PH	8.10	8.8	8.2	7.5	7.0
2	Electric Conductivity (EC)	2.965	1.0550	1.0520	1.045	0.95
3	Total Dissolve Solids (TDS)	1950	1820	1650	950	780
4	Alkalinity	320	305	290	185	160
5	Total Hardness (TH)	490	130	320	360	240
6	Dissolved Oxygen (DO)	2.8	2.5	4.9	5.2	4.5
7	Bio Chemical Oxygen Demand (BOD)	24.5	20.7	15.5	11.5	6.8
8	Chemical Oxygen Demand (COD)	142	120	105	85.5	32.5
9	Calcium	120	109	105	95.5	77
10	Magnesium	75	68.5	70	58.5	46
11	Sulphate	420	385	310	265	125
12	Nitrates	55	45.7	35.5	28	17
13	Chlorides	280	250	270	220	160

Except pH and EC (ds/m), all unit are in mg/L

Total dissolved solids denote presence of different minerals in water, TDS is mainly on account of carbonates, bicarbonates, chlorides, sulphates, phosphate nitrate, calcium, potassium, Iron. TDS level tested at all sites were within the permissible limits. A high value was observed at site-1 (Mashani Nala) and site-2 (Vishram Ghat). Alkalinity is a measure of the capacity of water to absorb hydrogen ion. The higher value of alkalinity indicate presence of bicarbonates, carbonates and hydroxide in water body²³. Alkalinity levels tested at all sites within the permissible limits (160-320 mg/l) as recommended by BIS (1991)¹⁹. Hardness is caused by the presence of soluble salt of Ca, Mg, Sr, Fe & Ni. It is characterized by reduction of lather efficiency of water with soap. In the present investigation the hardness values ranged from 240-490 mg/l the all site were found within the permissible limits by BIS 1991. Dissolved oxygen content is an indicator of organic pollution its value was observed ranged (2.5-5.2 mg/l).

Its value was lower than 4 mg/L which is not suitable for aquatic life. Dissolve oxygen at different site fluctuated from 2.5-5.2 mg/l being very low at site-1 (Mashani Nala) and site-2 (Vishram Ghat). This may be due to the microbial decomposition of organic component of sewage and industrial water in the river water. Dissolved oxygen of water used by micro organism in the biological oxidation of organic matter is reflected in terms. The high BOD value indicates more organic waste present in the water source the ranged from BOD observed in 6.8-24.5 mg/l the maximum BOD found at site-1 (Mashani Nala), Site-2 (Vishram Ghat) and site-3 (Railway Bridge) the observed result are in close arrangement with study of Jangala and Vaishnav [22] in Korba District, C.G. India. These value are above the standard limit for drinking water suggested BIS 1991 [14]. During the study period, chemical oxygen demand (COD) value ranged between 32.5-142 mg/l the maximum value are observed at site-1 (Mashani Nala) which may ascribe to high concentration of organic . material source. These ranged of value are higher than the maximum permissible limit as per BIS [14] suggesting that water sample is more severely affected with organic pollution. Desirable limit of calcium ion in drinking water is 75 mg/l and permissible limit is 200 mg/l [14] its concentration ranged from 77-120 mg/land was within the site-1 (Mashani Nala) recorded slight higher value of calcium.

The desirable limit of magnesium for drinking water is 30 mg/l and permissible limit is 100 mg/l [14] its higher value observed at site-1 (Mashani Nala). It's the opinion that higher value of calcium and magnesium may be due to addition of salt from detergents and other man made activities due to lack of effluent facilities and proper disposal system of waste water, Water bodies are getting polluted day by day causing adverse effect on soil flora and fauna. The sulphate concentration ranged from 125-420 mg/l. The maximum value was found in water sample collected from site-1 (Mashani Nala) which can be attributed to the discharge of domestic sewage and organic wastes in the study area. Excess amount of sulphate may have laxative effect.

The desirable limit for chlorides is of 250 mg/l as prescribed by BIS [14]. Presence of higher level of chlorides is considered as pollution indicator[20]. The chloride concentration ranged from 160-280 mg/l. Chloride concentration were slightly high at site-1 (Mashani Nala) and site-3 (Railway Bridge). Higher values of these urban sites are due to large amount of sewage discharges and increased rate of decomposition of organic matter because of high temperature during pre-monsoon season [18]. The nitrate concentrations ranged from 17-55 mg/. Higher values were observed at site-1 (Mashani Nala) and site-2 (Vishram Ghat) because of mixing of various effluents from industries and other waste material. Similar observations were made by Shridhar et. al. [21] in the Palk bay of south east coast of India.

CONCLUSION

The present study revealed deterioration in the water quality of river Yamuna on the high pollution level at the some stations. In view of the findings made in the present study following recommendations are made for better water quality management of the river.

- The local public has to be informed about proper waste disposal and the importance of clean water.
- The municipal waste sanitary effluents domestic sewage and industrial effluents should not be discharged into the river. Instead a central sewage system must be provided for first there while the industrial effluents should be treated properly before they are drained out.
- City garbage should be dumped into low lying areas and proper separation of the biodegradable and non biodegradable materials should be done.
- Regular monitoring of drinking water sources should be done.

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How to cite this article

Ajit Kumar Sharma, Nidhi Sharma, Ravi Sharma. Study of Physico-chemical Characteristics of Water Quality of Yamuna River at Mathura, UP. *Bull. Env. Pharmacol. Life Sci.*, Vol 2 (10) September 2013: 131-134