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Physico-chemical character from the middle stretch of the Yamuna river at Mathura district Uttar Pradesh

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Abstract

The river Yamuna is relatively clean till it enters Delhi at the Wazirabad Barrage. By the time it leaves the city it is a sewer caring the waste to downstream users. During most of its journey in the polluted strikes. The Yamuna has little flow to maintain its assimilative capacity. The ability to dilute waste. This is because firstly, cities take clean water from the river and return only waste. Secondly, the waste water flow in to the river has increased phenomenally, widening the gap between the waste generated and treated. Urban density along Yamuna's course is increasing along with the inflow of untreated sewage and industrial effluents. The river is not just polluted at its urban centers. Delhi, Mathura or Agra –it is increasingly dirty all along its full stretch what is certain is that the Yamuna is only a disposal medium for industrial and domestic waste. Nineteen drains crisscross Mathura before discharging into the river. The swears connected 60% of the population before YAP. Part of the sewage was taken to a sewage farm in the trans-Yamuna area. When their was no demand for treated water for irrigation. It was discharged into the river untreated. In colonies, sewage facilities were not available night soil and sullage flowed directly into open drains leading ultimately to Yamuna. In the present paper discussed as physic-chemical aspects of Yamuna river at Mathura city in duration of pre –monsoon in sampling point viz. Mashani nala, Railway bridge and Visram ghat. The parameter examined were pH, E.C., TDS, COD, BOD, DO, Calcium Nitrates. At three sampling sites, the result showed that water quality at these site were with in not permissible limits.

Key words: Physico-chemical aspects, Yamuna river water, Mathura city.

Introduction

Water is on the essential commodities to sustain life and is considered to be an enigma. It is not only essential for mankind but also equally indispensable for agriculture and other industries. The quality of life depends upon the quality and quantity of the water available for various needs. Safe and adequate water is not only a public health necessity but also an important infrastructure for economic development. The 12th world health assembly held at Geneva in 1954. Declared water as commodity a social benefit and economic and industrial resources.

As we know our life depends upon water and man needs water for his drinking and other domestic and industrial civilization. The demand for water is increasing tremendously day-by-day. Water is a major constituent of the environment around the mankind. Any change in the environment. Which leads to its deterioration causes pollution of the environment .Although all pollutants are several types of pollutants. Which can up set the life of human, plants and Animal? There are a number of sources which are responsible for the acute problems of water pollution. The major ones are domestic, industrial, Agricultural and microbiological.

All most 75% of the water in India has become polluted due to discharge of domestic sewage, municipal waste drain, urban agricultural waste, large scale of industrial effluents near by mix in the river and make the river water as contaminated one (Sangu & Sharma1987, Arora *et. al.* 1985, Ghose *et. al.*1986, Sahal & Pandey 1987). The important management of water system may cause serious problem in availity and

quality of water (Subbarao & Subbarao1995, Kumar & Saha1991, Nag & Das1994, Sharma 2004, Sharma & Parashar 2012). Since river are a major sources of water and their waste need to be maintained (Murthy & Ravanaidh 2011, Jajawara & Shringi 2012). For water to be described as potable. It has to be complete with certain physico-chemical standard which are designed to ensure that the water is safe for drinking (BIS 1991, APHA 1989).

Mathura situated on the right bank of the Yamuna river about 145 Km south east of Delhi and 58 Km 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, silver polishing electroplating, supari industries, milk processing, cured, oil, sugar factory etc. The development of city has caused directly a number of water quality problems (Khube & Durgpal1993, Kumar *et. al.* 1994, WHO1993, Khana 2011).

Material and Methods

Water sample were collected from 3 sites during pre monsoon period (April to May) in the year 2013 and analyzed for different Pysico-chemical parameters. The samples were collected in polythene container of 2 liter capacity from each site in morning hours between 8 am to 10 am was analyzed following standard methods (APHA 1989). The results were also compared with the Indian Standards.

Result and Discussion

The various Physico-chemical parameters of the Yamuna river water are presented in the Table 1. The pH values (8.2 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 dependant upon the relative quantities of calcium, carbonates and bicarbonates. The water trends to be more alkaline when it is possess carbonates (Suryanarayana 1995).

Table 1 Physico-Chemical Characteristics of Yamuna River water at Mathura Pre-Manson 2015

SN	Parameter	Site – 1 (Mashani Nala)	Site -2 (Visharam Ghat)	Site -3 (Railway Bridge)
1	pH	8.10	8.8	8.2
2	E.C.	3.965	1.520	1.045
3	T.D.S.	1950	1820	1650
4	Alkalinity	320	305	290
5	Total Hardness (T.H.)	490	230	320
6	Dissolved Oxygen (D.O.)	2.8	2.5	4.9
7	(B.O.D.)	24.5	20.7	15.5
8	(C.O.D.)	142	120	105
9	Calcium	220	109	105
10	Nitrates	55	45.8	38.8

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 which was 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 3.965). In the present study, the EC value falls in the moderate contaminated category. Similar observations were recorded by Krishnamurthy & Bharti (1994) form the Kalu river in North Karnataka.

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 (Trivedy & Goel 1986). 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 indicates presence of bicarbonates, carbonates and hydroxide in water body (Jain *et al.* 2000). Alkalinity levels tested at all sites with in the permissible limits (290-320 mg/l) as recommended by BIS (1991). Hardness is caused by the presence of soluble salt of Ca, Mg, Sr, Fe and Mn. It is characterized by reduction of lather efficiency of water with soap. In the present investigation, the hardness values ranged from 130 to 490 mg/l. The all sites were found within the permissible limits by BIS 1991. Dissolved oxygen content is an indicator of organic pollution. The values were observed between 2.5 to 4.9 mg/l.

It's valued lower than 4 mg/l which is not suitable for aquatic life. Dissolve oxygen at different site fluctuated from (2.5-4.9 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 BOD values were observed in 15.5-24.5 mg/l. The maximum BOD found at site-1 (Mashani Nala) compared to site-2 (Vishram Ghat) and site-3 (Railway Bridge). The observed result is closely similar with study of Jangala & Vaishnav (2012) in Korba district, C.G. India. These value are above the standard limit for drinking water suggested by BIS (1991). During the study period, chemical oxygen demand (COD) value ranged between (105 -142 mg/l). The maximum value was observed at site-1 (Mashani Nala) which may ascribe to high concentration of organic material source. These ranged of value are higher that the maximum permissible limit as per BIS (1991). Values are suggesting that the water sample is more affected with organic pollutant. Desirable limit of calcium ion in drinking water is 75 mg/l and permissible limit is 200 mg/l (BIS 1991). Its concentration ranged from (105-220 mg/l) and within the site-1 (Mashani Nala) recorded slight higher value of calcium.

The nitrate concentrations ranged from (35.5-55 mg/l). 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.* (2006) in the Palk basin of south east coast of India.

Conclusion

The present study reveled 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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