PHYSICO-CHEMICAL ANALYSIS OF YAMUNA RIVER WATER AT AGRA, UTTAR PRADESH

K. D. Mishra
Department of Chemistry,
Agra College, Agra- 282001
Affiliated to Dr.B.R.A.University, Agra, India
Email: kdmishra61@gmail.com

Abstract: This paper illustrates the quality of Yamuna River water from the Agra region of Uttar Pradesh. This river is the second largest tributary of Ganga which flows from Uttrakhand to Haryana and then enters into Noida, Uttar Pradesh, and lastly merges into Ganga River at Triveni Sangam in Prayagraj, Uttar Pradesh. This river is highly polluted due to industrial waste, agricultural waste, and fertilizers. During the investigation, the researcher tried to find out the Physico-chemical characteristics of Yamuna River water for five months. Six Sampling sites were selected in the Agra region for water quality check. The finding of the present research reflects that the water quality of the Yamuna River is very poor and is not useful for drinking and domestic purpose.

Key Words: Yamuna River, Agra, Water Quality Parameters, Water Pollution, BIS, CPCB.

I. Introduction

The Yamuna River is an invaluable asset to India's cultural heritage. This river originates from Yamunotri (Uttrakhand), the peak of Bandarpooch hills in the uppermost region of the Himalayas. Water is very important for human survival and all ecosystems. This river is very important for the Agra district and is the lifeline of Agra city. People use the water for drinking, farming, bathing, and also used in industries. Agra is divided into 90 wards having a population of 2,26,2000. Several small manufacturing units, like paper, bathroom cleaning brushes, leather, textiles, distilleries, chemical, pharmaceutical, oil refineries, etc are situated at the bank of river Yamuna. All these industries are the key source of water pollution in the Yamuna River in Agra. Domestic unwanted materials and agricultural waste also pollute the Yamuna River. In Agra 60-70% of water is used for agriculture purposes, 15-20% is used for industrial purposes and the remaining is used for domestic purposes.

II. Location of Sampling Points

The Yamuna River samples were collected on a monthly basis in the winter season from (November to March) at six selected points once a month during the time period at the fixed intervals between 7 to 10 AM. Selection points are in the sequential manner of water flow from upstream to downstream. These points are Kailash Ghat, Pohiya Ghat, Baleshwar Ghat, RamBagh Ghat, Hathi Ghat, Taj Mahal Ghat. They are referred to as SA_1, SA_2, SA_3, SA_4, and SA_5 & SA_6 respectively. Each point's location was nearly around 2-4 km from its nearest site.

III. EXPERIMENTAL METHODOLOGY

The Yamuna River water samples were collected on a monthly basis in the winter season from November to March at fixed intervals between 7 to 10 AM. The temperature of the season varies between 17°C to 23°C. Parameters like pH, DO, BOD, COD, TDS, Cl, Hardness, and Salinity were analyzed by a standardized method [1-2]. Standardized permissible limits prescribed by Bureau of Indian Standard are as follows:

Table1: Water Quality Criteria Prescribed by Bureau of Indian Standard (BIS)

Water Quality Parameters	Unit	Permissible Limits (BIS)
Temperature	°C	*****
pH	**	6.5-8.5
Dissolved Oxygen (DO)	mg/L	4.0-6.0
Biochemical Oxygen Demand (BOD)	mg/L	10
Chemical Oxygen Demand (COD)	mg/L	20
Total Dissolved Solid (TDS)	mg/L	500
Chloride (Cl)	mg/L	250
Hardness	mg/L	200
Salinity	ppt	-----

Table 2: Physico- Chemical Characteristics of Water Samples

Parameters	Sampling Points	NOV	DEC	JAN	FEB	MAR
	SA_1	7.1	6.9	7.0	7.1	7.2
	SA_2	7.2	7.0	7.1	7.2	7.3
pH	SA_3	7.3	7.1	7.1	7.3	7.4
	SA_4	7.4	7.3	7.4	7.6	7.8
	SA_5	7.6	7.5	7.5	7.8	8.0
	SA_6	7.7	7.6	7.7	7.9	8.1
	SA_1	5.0	5.1	5.2	4.8	4.6
	SA_2	4.8	5.0	5.1	4.7	4.5
DO	SA_3	4.6	4.9	4.9	4.6	4.4
	SA_4	3.9	4.1	4.3	3.7	3.5
	SA_5	3.7	3.8	3.9	3.3	2.7
	SA_6	3.6	3.7	3.8	2.9	2.5
	SA_1	16	14	13	15	19
	SA_2	17	16	14	17	20
BOD	SA_3	19	17	15	17	21
	SA_4	20	19	17	19	21
	SA_5	22	20	19	21	23
	SA_6	25	23	21	23	25
	SA_1	57	49	51	54	61
	SA_2	61	57	59	63	67
COD	SA_3	63	59	60	66	72
	SA_4	69	63	65	71	79
	SA_5	78	70	73	80	89
	SA_6	87	83	86	91	97
	SA_1	740	803	857	998	1017
	SA_2	820	860	897	1004	1083
TDS	SA_3	870	965	1050	1087	1155
	SA_4	986	1005	1095	1100	1265
	SA_5	1040	1135	1228	1280	1311
	SA_6	1060	1160	1255	1320	1391

	SA_1	261	251	254	265	270
	SA_2	265	257	263	278	287
Cl	SA_3	274	269	271	283	299
	SA_4	288	278	283	299	317
	SA_5	324	317	321	343	371
	SA_6	349	324	335	378	390
	SA_1	296	285	294	315	337
	SA_2	298	292	297	317	340
Hardness	SA_3	307	299	302	321	344
	SA_4	311	301	307	336	357
	SA_5	387	383	392	415	446
	SA_6	409	405	429	461	480
	SA_1	0.27	0.23	0.20	0.21	0.22
	SA_2	0.28	0.24	0.22	0.23	0.24
Salinity	SA_3	0.28	0.26	0.23	0.24	0.26
	SA_4	0.32	0.30	0.30	0.31	0.33
	SA_5	0.34	0.32	0.31	0.34	0.36
	SA_6	0.36	0.33	0.32	0.35	0.38

Source: Evaluated By Researcher

IV. RESULTS & DISCUSSION

The Yamuna River is one of the worst polluted rivers in North India. A large number of population and industrial units are situated near the bank of the river. A domestic and industrial effluent contaminates the river water to a greater extent. According to the Uttar Pradesh Pollution Control Board, the main reason behind this is the major drains of the city emptying their filthy content into the Yamuna River. Although the government is spending about 48 Crores per year on sewer networks and treatment plants, yet the untreated & unchecked industrial and sewage waste continues to flow in the Yamuna and pollute the water. Presently the river water is not only potable rather it is also unfit for irrigation and bathing.

Several Physico- chemical parameters were analyzed by standard methods and a comparison has been made according to BIS. The temperature ranges vary between 17°C to 23°C in the study period. The pH of river water varies from 6.9 to 8.1 which are in permissible limit. The dissolved oxygen value varies from 2.5 mg/L to 5.2 mg/L. The TDS value varies between 740 to 1391 mg/L. The high value of TDS indicates the presence of organic matter in the Yamuna water. The salinity value varies from 0.28 to 0.38 ppt. The total hardness values ranged between 285 mg/L to 480 mg/L, which indicates the presence of Calcium and Magnesium salt in the water samples. The Chloride value varies from 251 mg/L to 390 mg/L, which is above the permissible limit. It indicates the presence of excess salt in water. The BOD value varies between 13mg/L to 25 mg/L, which is not within the permissible limit. It indicates the presence of organic matter in the sample river water. The COD value ranged between 49 mg/L to 97 mg/L, which is beyond the permissible limit and indicating oxidation of water borne organic and inorganic matter present in the Yamuna River water sample.

V. CONCLUSIONS

Present study was conducted to observe the water quality of the Yamuna River in Agra during the winter season from November to March. This study reveals that a large number of water samples, collected from different Sampling points, goes beyond the highest level of water quality index and are severely polluted due to which it can't be used for drinking purpose. Except for pH, all water quality parameters like BOD, COD, TDS, Cl, and Hardness do not lie within the standard permissible limits prescribed by BIS. The Dissolved oxygen lies within the limit in some sites during the winter season. Evaluation of the water quality of the Yamuna River indicates that the water quality is worst; it is not useful for drinking and bathing.

VI. SUGGESTIONS

Suggestions to improve the quality of Yamuna water are as follows:-

- Industrial Wastewater must be properly treated before discharging into the river, as per guidelines prescribed by CPCB.
- Arrangements of fencing along the bank of the river to prevent direct disposal of domestic waste and other polluting materials.
- Launching awareness programs from time to time among the people residing near the bank of the river to take part in pollution prevention activities and minimize the pollution.
- Encouragement of plantation activity along the bank of the Yamuna River which prevents the agricultural run-off into the river containing pesticides and fertilizers residues.

VII. REFERENCES

[1] ISI, 1993. "Indian Standard of Drinking Water Specification Bureau of Indian Standards", New Delhi.

[2] BIS, Standards Tolerance Limits for bathing Water, Bureau of Indian Standard IS (1982), Page. 2296

[3] Sengupta, B. (2006). Water Quality Status of Yamuna River (1999-2005): Assessment and Development of River Basin Series: ADSORBS/41/2006-07" CPCB Delhi.

[4] Misra, A. K. (2010). A River about to die: Yamuna. Journal of Water Resource and Protection, 02 (05), 489-500, doi: 10.4236/jwarp.2010.25056.

[5] Maiti, S. K. (2011). Handbook method in environmental studies, Oxford book Company, New Delhi.

[6] Lavaniya, Arun., Diwakar, R.P and Raut, Chadetrik. (2015). Assessment of Water Quality of Yamuna River in Rural and Semi-Urban Settings of Agra, India. International Journal of Earth Science and Engineering, Vol. 08 (4), Aug 2015, P.P. 1661-1666.

[7] Parmar, Shobhika and Singh, V. (2015). Water Quality parameters of river Yamuna in Delhi after 20 years of the Yamuna action plan. International Journal of Science and Nature, Vol. 6 (4), P. 662-669.

[8] Hassan, T., Parveen. S., Bhat, B. N., & Ahmad, U. (2017). Seasonal Variations in Water Quality Parameters of River Yamuna, India. International Journal of Current Microbiology and Applied Science, Vol. 6 (5), Page 694-712.