

Assesment of kali river water pollution - a quantitative approach

Ramakant Ram¹, D.K.Sinha*, Navneet Kumar³

1. Research Scholar, Singhania Univ, Jhuhunu, Rajasthan

3. Department of Chemistry, Teerthankar Mahaveer University, Moradabad-244001(India)

* Author for Correspondence, Department of Chemistry, K.G.K.College, Moradabad-244001(India)

E-mail : dkskgh@rediffmail.com

Submitted : 27.05.2012

Accepted : 02.06.2012

Published : 10.9.2012

Abstract

A quantitative approach for the assessment of Kali river water pollution has been carried out on the basis of calculated values of water quality indices(W.Q.I.). Water quality index for nine sites has been calculated with the help of estimated values of ten different water quality parameters and drinking water standards prescribed by World Health Organization(W.H.O.). River water was found to be severely polluted at all the sites of study with W.Q.I. values more than 100. People exposed to water of source of study are prone to health hazards of polluted water. Calculated higher values and estimated values of different parameters both verify the extent of water pollution. Hence, assessment of water quality on the basis of calculated values of W.Q.I. is proved to be an effective tool.

INTRODUCTION

Total annual river flow of the world is 37000 km³ while that of Indian rivers is 1645 km³ and this constitutes about 45% of the total world river water. Land mass of India is criss-crossed by various rivers. In Indian culture and tradition rivers are not only geomorphologic and hydrological object but are also considered as sacred and are lifeline of many villages, towns and cities.

Availability of water resources required for survival of living creatures is shrinking at an alarming rate. One third of world's population is currently living in the regions that are classified as 'water stressed'. The matter of quality and quantity of water and water resources are of high concern.^[1-4]

The Kali river is one of the largest tributary of holy river Ganga and flows through Indo-gangetic plains. It originates from Antwara village of tahseel Jansath near Khatauli town of Muzaffarnagar district of western Uttar Pradesh. It lies between 29°33'N to 29°21'N and 77°43'E to 77°39'E. the catchment area of Kali river also covers parts of Meerut, Ghaziabad, Bulandshahar, Aligarh, Kashiram Nagar, Etah, Farukhabad, and Kannauj districts. The quantity and quality of river water is affected by the discharge from municipal and industrial area as well as from runoff from agricultural areas. Apparently also the river water quality seems to be highly polluted.

Water Quality Index(W.Q.I.) is regarded one of the most effective way to communicate water quality. The data of quantitative analysis and W.H.O. standards are used for calculating water quality indices.^[5,6]

METHODOLOGY

To estimate important water quality parameters of Kali river water, seven different sites were selected. All the samples were collected and analyzed quantitatively following standard methods and procedures of sampling and estimation.^[7,8] Description of sampling sites is presented in Table-1.

The estimated parameters are: pH value, conductivity, total dissolved solids, alkalinity, dissolved oxygen, biological oxygen

demand, fluoride, chloride and iron concentration. Water quality standards prescribed by World Health Organization(W.H.O.)^[9] were used for the calculation of water quality indices.

W.Q.I. of Kali river water at seven different sites were calculated using methods proposed by Horton and modified by Tiwari and Mishra.^[10,11] To include the collective role of various parameters on the overall quality of water, quality status is assigned on the basis of calculated values of water quality indices. The assumptions are:

W.Q.I.<50: fit for human consumption; W.Q.I.<80: moderately polluted; W.Q.I.>80: excessively polluted and W.Q.I.>100: severely polluted.

RESULTS AND DISCUSSION

The estimated water quality parameters with their W.H.O. standards and assigned unit weight (W_n) are presented in Table 2. Site-wise and parameter-wise estimated values (V_n) and calculated quality rating (Q_n) are presented in Table 3. Site-wise calculated values of Water Quality Index (W.Q.I.) are given in Table 4.

Critical analysis of data of W.Q.I. and its comparison with standard assumptions reveals following facts regarding the Kali river water pollution in the study area.

The observed range of water quality index was 105-207 except at site no. VII with W.Q.I. value of 75. Water with W.Q.I. values more than 100 are assumed to be severely polluted. Therefore, river water is severely polluted at all the sites of study except at site no. VII where water is found to be moderately polluted. The extent of water pollution is very-very high at site no. I and III. Comparison of estimated values of water quality parameters with W.H.O. standards also reveals that river water is severely polluted at all sites except at site no. VII with reference to parameters studied. This also verified the findings based on calculated values of water quality indices.

On the basis of above discussion, it may be concluded that the Kali river water of study area is severely polluted and pollution is maximum at site no. I and III and minimum at site no. VII. People

Table1: A brief description of Sampling Sites

Number and Name of site	Location of site	Apparent water quality	Use of water
I, Kali river at Sadhu Ashram, Aligarh Bridge	15 km North to Aligarh	highly turbid, foul smelling	Cattle bathing
II, Kali river at Sikandarpur, Aligarh Bridge	5 km East to site no. I	turbid, no smell	Irrigation
III, Kali river at Kasganj Bridge	3 km East to Kasganj district	highly turbid	Irrigation and cattle bathing
IV, Kali river at Malpurwa village, Kasganj	1 km North to site no. III	turbid	Irrigation
V, Kali river at Amarpurwa village, Kannauj	25 km East to site no. IV	clear, no smell	Irrigation and cattle bathing
VI, Kali river at Gumatiya village	4 km East to Kannauj district	clear	Irrigation
VII, Kali river at Kannauj Bridge	1 km South to site no. VI	clear, no smell	Bathing and Irrigation

Table 2 : Parameter-wise W.H.O. standards and their assigned unit weights (Wn)

Parameter	W.H.O. Standard	Unit Weight (Wn)
pH value	8.0	0.018006
Conductivity(μ S/cm)	0.300	0.480333
Total dissolved solids(mg/L)	500.0	0.000288
Alkalinity(mg/L)	100.0	0.001441
Dissolved oxygen(mg/L)	5.0	0.028820
Biological oxygen demand(mg/L)	6.0	0.024017
Chemical oxygen demand(mg/L)	10.0	0.014410
Fluoride(mg/L)	1.0	0.144100
Chloride(mg/L)	200.0	0.000721
Iron(mg/L)	0.5	0.288200

Table 3 : Site-wise and Parameter-wise actual value(Vn) and calculated quality rating(Qn)

Parameter	Site I		Site II		Site III		Site IV		Site V		Site VI		Site VII	
	Vn	Qn	Vn	Qn	Vn	Qn	Vn	Qn	Vn	Qn	Vn	Qn	Vn	Qn
pH value	9.50	250	9.40	240	9.35	235	9.30	230	9.21	221	9.22	222	8.46	146
Conductivity(μ S/cm)	3.179	1060	1.417	472	2.539	846	1.617	539	0.627	209	0.789	263	0.893	298
Total dissolved solids(mg/L)	2065	413	920	184	1650	330	1050	210	960	192	513	103	583	117
Alkalinity(mg/L)	1528	1528	1296	1296	1223	1223	1730	1730	1053	1053	610	610	585	585
Dissolved oxygen(mg/L)	3.40	117	3.50	116	3.95	111	3.3	118	4.5	105	5.0	100	495	100.5
Biological oxygen demand(mg/L)	165	2752	37	617	69	1151	66	1100	61	1017	39	650	37	617
Chemical oxygen demand(mg/L)	260	2600	80	800	160	1600	132	1320	128	1280	64	640	74	740
Fluoride(mg/L)	0.35	35	0.75	75	0.80	80	0.85	85	0.90	90	0.50	50	0.40	40
Chloride(mg/L)	68	34	65	33	55	28	130	65	46	23	42	21	29	20
Iron(mg/L)	0.113	23	0.170	34	0.130	26	0.125	25	0.124	25	0.17	34	0.105	21

Table 4 : Site-wise calculated values of water quality index

Number and Name of site	Water Quality Index
I, Kali river at Sadhu Ashram, Aligarh Bridge	204
II, Kali river at Sikandarpur, Aligarh Bridge	163
III, Kali river at Kasganj Bridge	207
IV, Kali river at Malpurwa village, Kasganj	166
V, Kali river at Amarpurwa village, Kannauj	105
VI, Kali river at Gumatiya village	114
VII, Kali river at Kannauj Bridge	75

exposed to the water of study area are prone to health hazards of polluted water and there is an urgent need for river water quality management. This way assessment of water quality on the basis of calculated values of W.Q.I. is proved to be an effective tool.

REFERENCES

1. Manna RK, Das AK, Impact of River Moosi on River Krishna. Poll. Res. 2004;23(1):117-124.
2. Sharma MR, Gupta AB, Seasonal Variation of Physico-chemical Parameters of Hathli Stream. Poll.Res. 2004;23(1):265-270.
3. Sinha DK, Srivastava AK, Water Quality Index for River Sai at RaeBareli. Indian J. Env. Prot. 1994;14(5):340-345.
4. Kumar N, Sinha DK, Monitoring of Trace Metals in Gagan River. Indian J. Env. Proc. 2006;26(6):516-520.
5. Pradhan SK, Patnaik D, Rout SP, Water Quality Index for the Ground Water. Indian J. Env. Prot. 2001;21(4):355-358.
6. Sinha DK, Saxena R, Contamination of Drinking Water at Hasanpur. Poll. Res. 2007;26(3):153-157.
7. APHA, Standard Methods for Examination of Water and Waste Water, 19th Ed., AWWA, WPCF, Washington D.C. 1995.
8. Merck E, The Testing of Water, Federal Republic of Germany. 1974.
9. W.H.O., International Standards for Drinking Water, World Health Organization, Geneva. 1971.
10. Horton RK, An Index Number System for Rating Water Quality. J. Water Poll. Cont. Fed. 1965;37:300-317.
11. Tiwari TN, Mishra M, A Preliminary Assignment of Water Quality Index. Indian J. Env. Prot. 1985;5(4):206-209.