Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2016, 8(2):474-478

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Deterioration of Karola river water quality of Jalpaiguri district, West Bengal from 2004 to 2014

Amrita Das

Department of Chemistry, P. D. Women's College, Jalpaiguri, West Bengal, India

---

ABSTRACT

The water quality of Karola River is decaying day by day. The comparison of the same parameters of year 2004 and year 2014-2015 prove the fact very prominently. The parameters like pH, Temperature, Conductivity, TDS, DO, Chloride, Alkalinity, Total Hardness, Mg-Hardness, Ca-Hardness, Turbidity etc. has been used for this purpose and all the results indicate the increasing rate in 2014-2015 specially the DO values are indicative of an alarming situation.

Keywords: deterioration, physicochemical parameters, pollution status, river Karola, water quality.

INTRODUCTION

Water is the basic need for a society. The water pollution is one of the most common and fast spreading types of pollution which affects the society adversely. The wastes generated in various work are not treated properly and disposed in sanitary manner which ultimately causes various types of water pollution. Rapid industrialization and population explosion as well as agricultural developments have brought about dramatic changes in the water bodies. Natural water contains different types of impurities are introduced into aquatic system by different ways such as weathering of rocks and leaching of soils, dissolution of aerosol particles from the atmosphere and from several human activities, including mining, processing and the use of metal based materials [1,2 and 3]. Comparison of water pollution parameters of recent year with the ten years back may provide a picture of the increasing pollution rate day by day. In present work the river karola has been chosen for the comparison. One work has been done in the year 2004 and another in the year 2014 - 2015.

The River Karola is mainly a rain fed river and a tributary of the River Tista. It is originated at the Terrain slopes of the Tista catchments area (Lat. about 25^0 N and Long.85^0 E) in Baikunthapur forest. The river flows almost parallel to the River Tista for about 45 Km and meets to Tista at Jalpaiguri town (Near Old Ferry Ghat).

The river carries direct sewages from the cremation ghat, Maskalai Bari, from Jalpaiguri District Hospital and from Dinbazar area. It divides the town Jalpaiguri into two halves and collected the swages from town area and drained them to the Tista at its downstream but presently new drains being constructed to drain the water into a small river Gadadhar. So the determination and comparison of pollution status of the river carries an important role for environment as it is a main river of Jalpaiguri town. Parameters like pH, Temperature, Conductivity, TDS, DO, Chloride, Alkalinity, Total Hardness, Mg-Hardness, Ca-Hardness, Turbidity etc. has been considered for the comparison.

EXPERIMENTAL SECTION

Water samples were collected separately from each of three sampling stations of the river. Temperature, conductivity, pH, TDS and DO were measured at the collection sites by Water Analyzer Kit, ELICO, India. Total harness, Calcium hardness, Chloride and alkalinity measured by titration. Indicator tablets were used for the estimation of Total hardness and Ca-hardness. Orthophosphate as phosphate 'P' was calculated from stannous chloride method using Double beam UV-VIS Spectrophotometer model SL-210 (Elico, India). The samples were preserved and analyzed for other parameters in accordance with the Standard Methods [4] and [5].

Sampling Sites: The three samples collection sites were – i) Maskalai Bari (Sample site A, Upstream), ii) Sadar Girls School (Sample site B, Midstream) and iii) Min-Bhaban (Sample site C, Downstream) of river Karola at Jalpaiguri town. The basis of selection of the sites was to assess the effect of different anthropogenic activities leading to deterioration and influencing the river water quality.

RESULTS AND DISCUSSION

We have chosen the winter season for the comparing of parameters 2004 with 2014-2015 by doing the average of six months period.

pH: The pH of the samples indicates the higher value in the current year than previous. The value greater than 8 indicates that the samples don't have free carbonic acid. The killing power of chlorine diminishes by increasing pH [2, 4]. The results show that unless the middle point, values are above 8 (Table 1). The higher pH values observed suggests that carbon dioxide, carbonate-bicarbonate equilibrium is affected more due to change in physico-chemical condition [6].

Electrical conductivity: The electrical conductivity is directly proportional to its dissolved mineral matter content including gases [2]. Range of conductivity preferred for irrigation water should be less than 250μmho/cm [7]. The average values of the water body have been increased recently (Table 1).

Total dissolved solids: It is within the limit and slightly increased in 2014-2015 (Table 1). Most aquatic ecosystems involving mixed fish fauna can tolerate TDS levels of 1000 mg/litre [8]. Dissolved solids in industrial waters are undesirable.

Chloride: The amounts of chloride in a water sample can give an indication of the amount of sewage effluent in river water [9]. Regarding irrigation waters, chloride is the most troublesome anion. Chlorides are generally more toxic than sulphates to most plants [4]. In present analysis we have seen that the chloride content of Karola River has much increased recently (Table 10).

Alkalinity: The determination of alkalinity provides an idea of the nature of salts present. The acid neutralizes the carbonates, bicarbonates and hydroxides in the sample, largely the first two components. These are the ultimate oxidation products of organic matter when it is purified by bacteria. The occurrence of hydroxide ions in natural waters is very rare, unless artificial contamination has occurred. If the alkalinity is lower than hardness, neutral salts of calcium or magnesium must be present that are not carbonates, usually these are sulphates [4]. The alkalinity has higher values in spot A. The other two spots have lower alkalinity value than hardness in present year (Table 1). The alkalinity has lower value than hardness in previous year.

Hardness: Hardness in water is due to the natural accumulation of salts from contact with soil and geological formation or it may enter from direct pollution by industrial effluents. The Hardness as $Ca(CO_3)_2$ in mg/litre, 0-75 soft, 75-100 moderately hard, 150-300 hard, above 300 very hard [3]. In the present case total hardness of water samples are increased but they are below 75 (Table 1). So water of Karola River is soft enough. The results of Ca and Mg Hardness suggested that the Mg- Hardness has been increased in 2004 to 2014-2015 but the Ca-Hardness remain more or less same in 2004 to 2014-2015.

Ca and Mg are essential to normal plant growth. The ions in irrigation water tend to keep soil permeable and in good tilth. Form Table 1 it is shown that Mg content has been increased than previous days.

Table 1: Comparison of Parameters of the year 2004 and the year of 20014-2015(Sample site A, Upstream), (Sample site B, Midstream), (Sample site C, Downstream)

Sl. No.	Parameters	Sampling Sites	Karola2004	Karola 2014 - 2015
1	pH	A	7.496	8.041
		B	7.169	7.748
		C	7.601	8.12
2	Conductivity in µmho/cm	A	83.806	83.55
		B	94.003	104.93
		C	91.79	108.23
3	TDS in mg/litre	A	40.763	40.63
		B	46.087	51.39
		C	44.96	53
4	Chloride in mg/litre	A	1.161	10.465
		B	1.548	20.93
		C	1.548	24.485
5	Alkalinity(mg) As $CaCO_3$ /litre	A	34.227	62
		B	36.223	47
		C	35.737	48
6	Total-Hardness as $CaCO_3$ mg/litre	A	31.333	48.675
		B	32	64.195
		C	30.333	52.435
7	Ca-Hardness as $CaCO_3$ in mg/litre	A	18.333	15.95
		B	18.667	18.52
		C	19.667	19.99
8	Mg-Hardness as $CaCO_3$ in mg/litre	A	13	32.725
		B	13.333	45.675
		C	10.667	32.445
9	DO in ppm	A	8.333	4.6
		B	7.733	4.37
		C	7.967	2.87
10	Turbidity in NTU	A	1	3.84
		B	0.833	4.56
		C	0.8	2.15
11	Ca mg/litre	A	7.332	6.38
		B	7.467	7.408
		C	7.867	7.996
12	Mg mg/litre	A	3.172	10.84
		B	3.253	11.145
		C	2.6	7.985

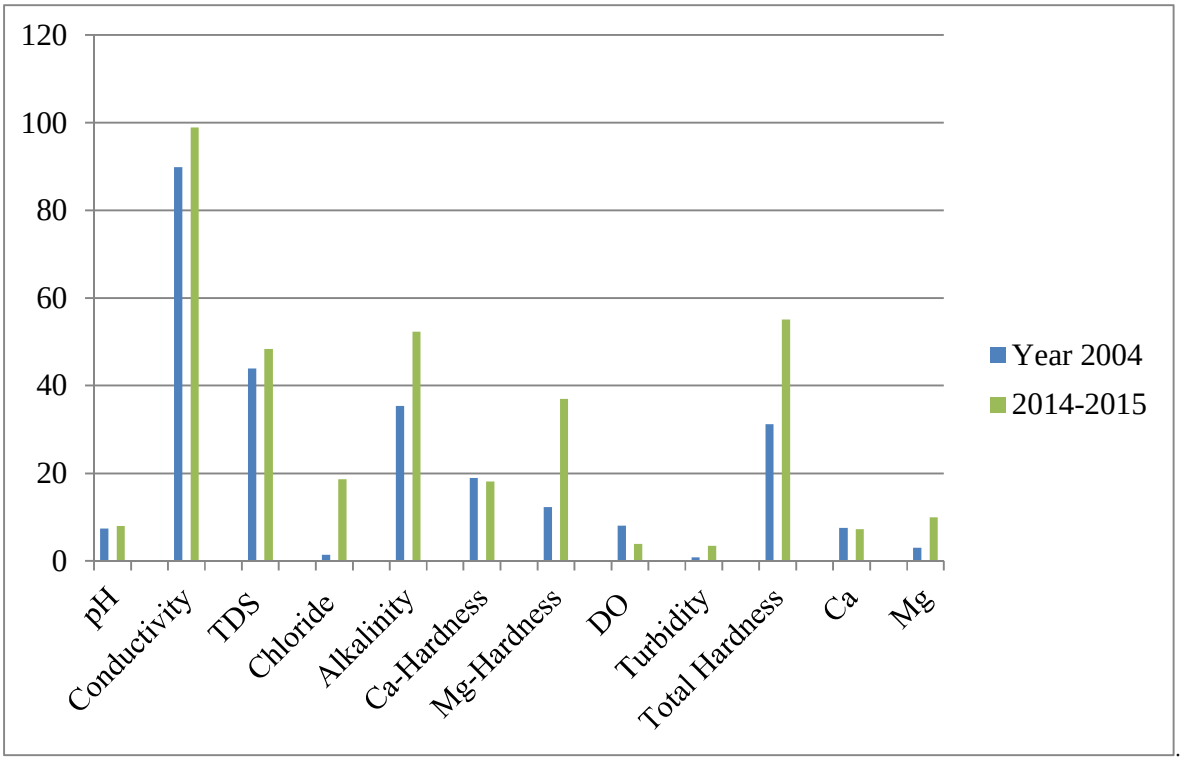
Table 2: Graphical representation of the parameters of the year 2004 and 2014-2015 for comparison

Sl.No.	Parameters	Year 2004	Year 2014-2015
1	pH	7.42	7.97
2	Conductivity in µmho/cm	89.87	98.9
3	TDS in mg/litre	43.93	48.34
4	Chloride in mg/litre	1.419	18.627
5	Alkalinity(mg) As $CaCO_3$ /litre	35.39	52.33
6	Ca-Hardnessin as $CaCO_3$ mg/litre	18.889	18.15
7	Mg-Hardnessin as $CaCO_3$ mg/litre	12.333	36.95
8	DO in ppm	8.011	3.94
9	Turbidityin NTU	0.878	3.51
10	Total Hardness as $CaCO_3$ mg/litre	31.222	55.102
11	Ca mg/litre	7.56	7.261
12	Mg mg/litre	3	9.99

Dissolved oxygen: Its correlation with water body gives direct and indirect information e.g. bacterial activity, photosynthesis, availability of nutrients, stratification etc. [10]. If the oxygen concentration is reduced by polluting substances such as organic matter or reducing agents, then fish and insect life can die [9]. DO level of river Karola has been decreased much in all the three spots [Table 1].

Turbidity: The degree of turbidity of a water course may be taken as a measure of the intensity of pollution [11]. Turbidity in water mainly arises from colloidal matter, fine suspended particles and soil erosion expect acid, alkali etc. The turbidity has been increased many times from 2004 to 2014-2015 (Table 1). From the graph we can

compare the average for six month periods of pollution parameters in 2004 and 2014-2015. It has clearly shown that the most parameters have been increased in 2014-15 (Table 1) than 2004.



CONCLUSION

The above discussion proves that the water of Karola River becomes more and more polluted day by day. The cause is mainly man made activity and garbage of the Jalpaiguri town which is disposed in Karola River. The over use of fertilizer in tea gardens and agriculture also a vital cause of deterioration of water quality. So it needs to take necessary steps to prevent the pollution of the river as the water has been not yet over polluted.

Acknowledgement
I thank the Officials and Staff of Public Health Engineering Department, Govt. of West Bengal, Jalpaiguri, for giving required help about the analysis. I also thankful to UGC for financial support through Minor Research Project.

REFERENCES

[1] K Ipinmoroti; O Oshodi, *Discovery Innovate*, **1993**, 5, 138.
[2] EI Adeyeye, *International Journal of Environmental Study*, **1994**, 45, 231-240.
[3] SS Asaolu; KO Ipinmoroti; CE Adeyinowo; O Olaofe , *African Journal of Science*, **1997**, 1, 55-61.
[4] N Manivasakam. Physico-chemical examination of water, sewage and industrial effluents, 6th Edition, Pragati Prakashan, Meerut, India **1980**.
[5] APHA,Standard methods for examination of water and waste water. 17th Edition, American Public Health Association/American Water Works Association/Water Environment Federation, Washington DC, USA, **1989**.
[6] KR Karanth. Groundwater Assessment Development and Management, Tata McGraw Hill publishing company Ltd., New Delhi, **1987**, 725-726.
[7] HH Willard, V Merritt, JA Dean. Instrumental method of analysis, 3rd Edition, Van No Strand, New York **1986**.
[8] Boyd, E Claude. Water Quality: An Introduction, Kluwer Academic Publishers Group, Netherlands, **1999**.
[9] Premlata; Vikal, *An International Journal*, **2009**, 1(2), 97-102.
[10] I Mathur, SS. Choudhary. Industrial pollution and its control, 1st Edition Aavishkar, Jaipur, India **2004**.

[11] SP Mishra. Environmental Pollution, Aavishkar, Jaipur, India, 1st Edition, **2006**.