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Assessment of Water Quality of Hasdeo River , Korea district, Chhattisgarh: with special reference to Pollution due to Coal mines

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Abstract

An investigation was undertaken to study of physical & chemical properties of Hasdeo river water at Korea district have been carried out and The parameters studied were pH, total alkalinity, total hardness, chloride, sulphate, fluoride, total dissolved solids and conductivity. Coal waste if discharged into river water can give rise to significant deterioration in its quality. This paper presents river water quality of Hasdeo river in Korea district. Nine different locations were selected for the study and compared. From overall analysis, it was observed that there was a slight fluctuation in the physico-chemical parameters among the river water samples studied. Comparison of the physico-chemical parameters of the river water sample with WHO and ICMR limits showed that the river water is slightly contaminated and account for not any health hazards for human use .

Keywords: physico-chemical, Pollutuion, parameter, contamination.

Introduction

Importance of river, in the maintaining a healthy as well as a prosperous nation in healthy environment is understood from the existence of the civilization on this globe. River water are primarily use to satisfying the daily needs of living world in and around them. These water resources are used to meet day-to-day requirements of human settlement, for production of hidden power and most importance of all , for agricultural , irrigation and industrial needs. All these aforesaid activities are expected to have a significant impact on the water quality. Furthermore, these human occurring in these waters. It is a major source of water for drinking, agriculture, irrigation, industrial purpose and other domestic needs of the district. The river receives domestic and other wastes regularly. Municipal sewage and garbage is regularly discharged into the river, also the increased industrial activity has lead to urbanization with the consequent increase in the discharge of wastes into river.

The objective of this study was to evaluate the extent of pollution to which the river was subjected..the study was carried out during post monsoon 2012.

Study area

Korea is one of the North-West District of Chhattisgarh State. The District came into existence on 25th May 1998 in Madhya Pradesh State. Its parent District was Surguja. After the formation of New State of Chhattisgarh on 1st November 2000, the District falls under the Chhattisgarh State. The District has derived its Name from the Korea State, the former princely State Korea. Korea district situated at between 23 deg. 02' 42" To 23 deg. 44' 46" North latitude and 81 deg. 46' 42" To 82 deg. 33' 43" East with the 700 meter above sea level.. River water and Underground water is the only source of water for the people of Korea. The river water quality of Korea is continuously degrading due to coal mining activities and the soils of the nearby fields are also being affected. Therefore, we have decided to analyze Hasdeo river water so that some remedies for the improvement could be possible.

Material & method

River water samples were collected from three different locations of Korea district during the post-rainy season (Sept -Oct 2012). Samples were collected in sterilized screw-capped polyethylene bottles of one liter capacity and analyzed in laboratory for their physico-chemical parameters. Samples collected from study sites were properly labeled and a record was prepared . Borosilicate glassware, distilled water and good quality reagents were used throughout the testing.

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Table I. Sampling points

Sampling station	Sampling point number
Jhagrakhand	1
Kujra	2
Ramnagar	3
Rajnagar	4
Bijuri	5
Katkona	6
Pandavpara	7
Jhilmili	8
West Chirimiri	9

Table II. Methods used for estimation of various physicochemical Parameter

Parameters	Method
Temperature	Thermometer
pH	pH metry
Total Alkalinity	Titration method
Total Hardness	EDTA Titration method
Turbidity	Turbidity Meter
Chloride	Silver nitrate Method
Dissolved Oxygen	Winkler method
Sulphate, Fluoride,Copper, Manganese, Nitrate,	Spectrophotometer
Selenium, Arsenic, Lead, Zinc	Atomic Absorption Spectrophotometer

Table III. Physico-chemical parameters of sampled waters

Parameters	Sampling point								
	1	2	3	4	5	6	7	8	9
Temperature (^{0}C)									
Ph	7.20	6.80	7.50	6.92	6.52	7.10	6.80	7.75	6.80
Total Alkalinity (mg/l)	196	188	60	188	68	116	116	112	80
Total Hardness (mg/l)	300	308	312	292	312	180	192	192	108
Turbidity,NTU	01	02	04	02	02	03	04	04	02
Chloride (mg/l)	22	44	22	24	20	20	16	20	26
Iron (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
D.O. (mg/l)	4.8	5.5	5.7	6.2	7.0	5.2	6.2	5.8	6.2
Total dissolved Solids (mg/l)	370	358	380	382	394	348	324	306	164
Sulphate (mg/l)	41	71	100	72	111	28	48	30	19
Nitrate (mg/l)	2.65	3.10	3.54	3.98	3.54	2.21	2.66	0.44	2.22
Fluoride (mg/l)	0.28	0.11	0.37	0.31	0.25	0.30	0.44	0.28	0.66
Copper (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Manganese (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Selenium (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Arsenic (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Lead (mg/l)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zinc (mg/l)	0.1	0.09	0.05	0.1	0.06	0.08	0.07	0.08	0.03

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Result & discussion

The samples collected from different area which main source is Hasdeo river, was analyzed. The analysis (Table 3) of 9 water samples includes the determination of concentration of inorganic constituents. The physico- chemical parameters, which were analyzed in post monsoon season September –October 2012, have been shown in Table 4.

The desirable pH range necessary for drinking water is from 7.0 to 8.5. The pH value of water sample in the study area ranged from 6.80 to 7.75. On an average, pH of all samples was in desirable limit as prescribed for drinking water standard.

Total alkalinity of water in terms of $CaCO_3$ varied from 60-196 mg/l. The values of total alkalinity were comparatively moderate. The water for domestic use having alkalinity less than 100 mg/l is safe. Minimum alkalinity was found from the sample station number 3 and maximum alkalinity was found from sample station number 1.

Total hardness was found in the sample water ranges from 108 -312 mg/l, which shows that water is safe for drinking purpose. Hardness has no known adverse effects on health. However, maximum permissible level prescribed by WHO for drinking water is 500 mg/l as set. According to some classifications, water having hardness up to 75mg/l is classified as soft, 76-150 mg/l is moderately soft, 151-300 mg/l as hard and more than 300 mg/l as very hard.

Turbidity observed from water samples ranged between 01- 04 NTU, which shows that turbidity found within the permissible limit.

Chloride content of the water samples was low in rainy season. According to WHO, maximum permissible limit for chloride is 500 mg/l. The value observed in present study is in the range of permissible limit ranged from 16 – 44 mg/l from the sample number 7 and 2.

Iron content found from the samples below the detection limit. Maximum permissible limit for iron is 0.3 mg/l. Iron content is being below the detection limit if it will be less than 0.05 mg/l.

Dissolved oxygen ranged between 4.8 – 7.0 mg/l from the sample 1 and 5 which shows that D.O. is slightly higher than the permissible limit.

Total dissolved solids (TDS) is a measure of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro granular suspended form. The permissible limit of TDS of drinking water is 500 mg/l (WHO). Total dissolved solid content of the water samples was found between 164 – 394 mg/l which is within the permissible limit.

The sulphate content varies between 19 to 111 mg/l and the fluoride content varies between 0.11 to 0.66 mg/l and Nitrate between 0.44 – 3.98 mg/l. The Sulphate, Fluoride and Nitrate values were also found to be within the prescribed limits.

Some other metal like Copper, Manganese, Selenium, Arsenic and Lead content of water samples were found below the detection limit which shows that there is no any harmful contamination in water samples.

Conclusion

The results of water investigation show that the water of different samples which main source is Hasdeo river are within the permissible limit except few parameters. As a result of above parameters of water is shows that water supplies to different areas for domestic and other uses is after the proper treatment by receiving from the Hasdeo river as it may be contaminated by traces and other heavy metal due to the presence of many coal mines near these area. So it is concluded from the above study that the water collected from different area of Korea district of Chhattisgarh (India) is portable.

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