

# Comparative Analysis of Physicochemical Parameters of Hasdeo River Barrage & Arpa River Water Samples of Bilaspur Region

Reeta Bajpai, M.Sc., Ph.D.

GGV, A Central University, Bilaspur, C.G., India

**Abstract-** The effluents from City drainage play a vital role in toxicating the River water quality. Hence the present study was undertaken to characterize the physicochemical parameters and comparative study of water samples of Hasdeo River barrage near Seepat NTPC & Torva dam of Arpa River in Bilaspur city. Evaluation of physicochemical parameters was carried out to assess the quality of River water, each parameter was compared with the standard desirable limit of that parameter in drinking water as prescribed by different agencies. A systematic calculation was made to determine the values of the observed parameters were worked out. Suitable suggestions were made to improve the quality of River water of Bilaspur Region.

**Index Terms-** Physicochemical analysis, River Water, Correlation Analysis, Bilaspur.

## I. INTRODUCTION

Water is the commonest fluid in nature. Water is also a vital resource for agriculture, manufacturing and other human activities. In urban areas, the careless disposal of industrial

effluents and other wastes in rivers & lacks may contribute greatly to the poor quality of river water [1-5]. Most of the rivers in the urban areas of the developing countries are the ends of effluents discharged from the industries. Asian countries experiencing rapid industrial growth and this is making environmental conservation a difficult task[6].

The quality[7,8] of ground water is the resultant of all the processes and reactions that act on the water from the moment it condensed in the atmosphere to the time it is discharged by a well desirable limit of water quality parameters in drinking water prescribed by different agencies is shown in Table 1. In Bilaspur industrialization and urbanization have major impact on river water environment. Both surface and subsurface water sources are getting polluted due to developmental activities. The effluents from the Seepat NTPC plant and drainage system of Bilaspur city greatly distress the geochemistry of the soil. The discharged chemicals interact with river water and alter the pH and other water quality parameters the social relevance of the problem has encouraged us in carrying out this work.

**Table 1. Drinking water quality standards**

Parameters	ISI		WHO		ICMR		BIS	
	HDL	MPL	HDL	MPL	HDL	MPL	HDL	MPL
pH	6.5-8.5	7.0-8.5	6.5-9.5	7.0-8.5	6.5-9.2	7.0-8.3	8.5-9.0	
TDSmg/L	500	2000	-	-	500	1500	500	200
Ca, mg/L	-	75	-	75	-	-	-	75
Chloride, mg/ L	-	250	-	250	-	250	-	250
TH, mg/L								
Alkalinity,mg/L	300	600	200	600	300	600	200	600
BOD	200	600	-	120	-	-	200	600
	30	-	-	30	-	30	-	30
COD, mg/L	150	255	-	255	-	-	150	255

HDL -Highest Desirable Level; MPL -Maximum Permissible Level; BIS -Bureau of Indian Standard; ICMR -Indian Council of Medical Research; WHO -World Health Organisation; ISI-Indian Standard Institute; TDS-Total Dissolved Solids; TH-Total Hardness; BOD-Biological Oxygen Demand; COD Chemical Oxygen Demand.

The quality of river water has been assessed by comparing each parameter with the standard desirable limit of that parameter in drinking water as prescribed by different agencies and sources.

## II. EXPERIMENTAL

### Study area

The physicochemical parameters of river water Hasdeo near NTPC SEEPAT and Arpa near Torva Dam were studied. The water was collected from the river located in Bilaspur region. Preparation of water samples the samples were collected in clean polythene bottles without any air bubbles. The bottles were rinsed before sampling and tightly sealed after collection and labeled in the field. The temperatures of the samples were measured in the field itself at the time of sample Collection. The samples were kept in refrigerator maintained at 40C.

### Analysis of water sample

Analysis was carried out for various water quality parameters such as pH, conductance, total dissolved Solids, total suspended solids, total hardness, total alkalinity, calcium, iron, biological oxygen demand and chemical oxygen demand (COD) as per standard procedures.

### Determination of water quality parameters

The water quality parameters analyzed were; pH-measured using standard pH meter, total Dissolved solids (TDS) by standard methods, calcium content by EDTA titrimetric method, chloride content by argentometric method, total hardness (TH) by EDTA titrimetric method, P and M alkalinity, BOD by dissolved oxygen loss method and chemical oxygen demand (COD) by potassium dichromate method.

## III. RESULTS AND DISCUSSION

The results of the physicochemical analysis of the river water samples HW and AW collected from Hasdeo river barrage near NTPC Seepat and Arpa river from Torva dam Bilaspur are shown in Table 2.

### pH

pH is considered as an important ecological factor and provides an important piece of information in many types of geochemical equilibrium or solubility calculation. pH is an important parameter in water body since most of the aquatic organisms are adapted to an average pH and do not withstand abrupt changes. The pH values fluctuated between 7.2 to 8.3 (Table 2). The limit of pH value for drinking water is specified<sup>5</sup>

as 6.5 to 8.5. The pH shows slightly alkaline trend. Generally pH of water is influenced by geology of catchments area and buffering capacity of water.

### Temperature

The temperature was found to be in the range between 28.2 to 27.60C during study. The higher value of water temperature observed in the present study could be attributed to the early summer months prevailed during the period of investigation.

### Total alkalinity

The standard desirable limit of alkalinity<sup>6</sup> in potable water is 120 mg/L. The maximum permissible level is 600 mg/L. The value of alkalinity for HW samples is 50 and for the AW is 200. The water sample of Hasdeo River shows lower value. The value of alkalinity in water provides an idea of natural salts present in water. The cause of alkalinity is the minerals which dissolve in water from soil. The various ionic species that contribute to alkalinity include bicarbonate, hydroxide, phosphate, borate and organic acids. These factors are characteristics of the source of water and natural processes taking place at any given time<sup>6</sup>. not have proper drainage system. They discharge the waste waters into the soil. This may lead to increase in alkalinity of ground water in these areas.

### Chloride

Chlorides are important in detecting the contamination of ground after by waste water. The permissible limit<sup>5</sup> of chloride in drinking water is 250 mg/L. The values of chloride observed in S1, S2, S3 and S4 were very low i.e. within the permissible limit, whereas the chloride value observed in S5 was well above the standard desirable limits prescribed by WHO (1984). The presence of chloride in slightly higher amounts in S5 may be due to natural processes such as the passage of water through natural salt formations in the earth or it may be an indication of pollution from industrial or domestic use.

### Total hardness (TH)

WHO has specified the total hardness to be within 200 mg/L of CaCO<sub>3</sub>. Regarding total hardness fluctuating trends in its value were observed in all the 5 stations. The observed total hardness values were well within the limits. Hasdeo water samples have comparatively low TH value (64-65mg/L) than Arpa water samples (195195.6 mg/L).

**Table 2. Comparison of physicochemical parameters of river water samples of Bilaspur region with standard values WHO**

Parameters	Hasdeo water Samples			Arpa water Samples			WHO
	S1	S2	S3	S4	S5	S6	
pH	8.3	8.0	8.2	7.4	7.2	7.5	7.0-8.5
TDS mg/L	117.4	116.9	117.2	368.8	368.0	368.72	500
Ca, mg/L	50	49	50	113.0	112.8	113.2	75
Chloride, mg/L	68.4	68.2	68.1	210.4	210.4	210.4	250
TH, mg/L	64	65	64	195	195	195.6	200
Alkalinity,mg/L	50	50	50	200	200	200	120
BOD	4.4	4.2	4.4	16.0	16.2	16.1	30
COD, mg/L	3.2	3.4	3.4	14	14	14.1	250

**Calcium**

Calcium concentrations were found to vary from 7 to 71 mg/L. The upper limit of calcium concentration for drinking water is specified as 75 mg/L (WHO). The calcium hardness observed in all the 3 samples of Hasdeo river water are well within the desirable limits with a minimum of 49 mg/L and for S4,S5 and S6 has observed higher values 112.8-113.2 mg/L..

**Biological oxygen demand (BOD)**

The observed BOD values for Arpa river water samples were found four times greater than that of Hasdeo river water sample 4.4mg/L. The permissible limit for drinking water is 30mg/L. BOD values were observed within the limit for all the samples.

**Chemical Oxygen demand (COD)**

Chemical oxygen demand determines the oxygen required for chemical oxidation of organic matter. COD values convey the amount of dissolved oxidisable organic matter including the non-biodegradable matters present in it. The observed COD values in all the 6samples are varying from 3.2-14.1mg/L. The permissible limit of COD for drinking water is 255 mg/L. Hence the observed COD values in all the 6 samples are well within the desirable limit.

**IV. CONCLUSION**

The analysis of the water quality parameters of River water from two different rivers in Bilaspur region shows that the pH, chloride ion, TDS, BOD and COD values are well within the permissible limits for the samples from Hasdeo water is due to the barrage water free from rural and urban drainage system. But

the Calcium hardness of Arpa water sample was well above the desirable limit and the average of alkalinity has exceeded the desirable limits.The Alkalinity is caused mainly due to OH, CO<sub>3</sub> andHCO<sub>3</sub> ions which are due to improper drainage system of the city area In conclusion from the results of the present study it may be said that the river water of its though fit for domestic and drinking purpose need treatments to minimize the contamination especially the Calcium and alkalinity. It indicates that the Arpa water is highly polluted and unsafe for domestic purpose.

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AUTHORS

**First Author** – Reeta Bajpai, M.Sc., Ph.D. , GGV, A Central  
University, Bilaspur, C.G., India