Pre-monsoon physico - chemical analysis of surface water of Jashpur District Chhattisgarh (C.G.)

Rajiv Ratna Pandey, Dr. M.R. Augur

Abstract— **Water samples were collected from two sampling station viz., station 1 Dhondidand and station 2 Dhondibahar of Ib river of Jashpur district in Chhattisgarh state during March 2013 to June 2013. The samples were subjected to laboratory analysis using atomic absorption spectrophotometer (AAS) to assess the levels of heavy metal such as Chromium (Cr), Cadmium (Cd), and Nickel (Ni). Standard procedures (including on site analysis) were used to determine the physicochemical parameters such as Temperature, pH, Turbidity, Alkalinity, Total Dissolved solids (TDS), Dissolved oxygen (DO), Sulphate, Fluoride and Total Hardness of the river water samples. The ranges of values of the observed parameters were Temperature (21.4-28.3) ^{0}C; pH : (7.22-7.82); Turbidity : (2-6) NTU; Alkalinity : (5-11) mg/l; Total dissolved solids : (30-38) mg/l; Dissolved oxygen : (4.4-5.0) mg/l; Sulphate : (5.8-7.9) mg/l; fluoride : (0.25-0.53) mg/l; Total hardness : (23-29) mg/l. All the values were within the WHO, WHO/UNICEF and the USEPA guidelines. The values of these parameters indicate that Ib river is moderately not polluted.**

Index Terms— **Physico-chemical parameters, heavy metals, sulphate, fluoride.**

INTRODUCTION

Rivers are water ways of strategic importance across the world, providing main water resources for domestic, industrial and agricultural purposes (Faith, 2006). Rivers play a major role in integrating and organizing the landscape and moulding the ecological setting of a basin. They are prime factors controlling the global water cycle and in the hydrologic cycle, they are the most dynamic agents of transport (Garrels et al., 1975). The quality and quantity of surface water in a river basin is influenced by natural factors such as rainfall, temperature and weathering of rocks and anthropogenic changes that curtail natural flow of the river, or alter its hydrochemistry (Raj and Azeez, 2009). Quality of water generally refers to the component of water, which is to be present at optimum level for suitable growth of plants and animals. Various factors like temperature, turbidity, nutrients, hardness, alkalinity and dissolved oxygen play an important role for the growth of plants and animals in water body. (Kamal et al., 2007).

River pollution in India has now reached to a point of crisis due to unplanned urbanization and rapid growth of industrialization. The entire array of life in water is affected due to pollution in water. The problem of water quality

deterioration is mainly due to human activities such as disposal of dead bodies, discharge of industrial and sewage wastes and agricultural runoff which are major cause of ecological damage and pose serious health hazards (Meritei et al., 2004).

It is estimated that community waste from human activities accounts for four times as much wastewater as industrial effluents, most of which is discharged untreated/partially treated into the water courses in India (Sahu, 1993). An attempt has therefore been made to study water quality of Ib river in Jashpur district, Chhattisgarh.

Materials and Methods

Ib river located at Jashpur district of Chhattisgarh. The Ib valley coal field derives its name from Ib river, a tributary of Mahanadi river. Two sampling locations were selected along the Ib river. The samples were collected for four months (March 2013 to June 2013) to check possible temporal changes. The parameters like temperature, pH, Turbidity and dissolved oxygen were recorded in field. Laboratory evaluations were carried out to referring standard method's (APHA 1992) to analyze chemical water quality parameters i.e. Alkalinity, TDS, sulphate, Fluoride, and total hardness. Heavy metal i.e. chromium (Cr) Cadmium (Cd) and Nickel (Ni) were analyze by atomic absorption spectrophotometer (AAS). River water quality study is usually required for stabilizing base line conditions, setting quality certain and standards, monitoring of temporal (Kamal et al., 2007)

Temperature – Temperature was found to be ranged between minimum 21.4^{0}C to maximum 28.3^{0}C. impinging solar radiation and the atmospheric Temperature brings interesting spatial and temporal changes in natural waters. The rise in Temperature of water accelerates chemical reactions, reduces solubility of gases, amplifies taste and odour and elevates metabolic activity of organisms (Usharani et al., 2010).

pH – pH of the aquatic system is an important indicator of the water quality and the extent pollution in the watershed areas. pH was recorded to be varying from minimum 7.22 to maximum 7.82. (Jonnalagadda et at., 2001). It has been mentioned that he increasing pH appear to be associated with increasing use of alkaline detergents in residential areas and alkaline material from waste water in industrial areas (Chang, H., 2008).

Turbidity – Turbidity values ranges from minimum 2 NTU to maximum 6 NTU. Decreased turbidity was attributed to no soil erosion in the nearby catchment.

RESULT AND DISSCUSSION
Station - 1- Dhondidand

Month & Year	Temperature	pH	Turbidity	Alkalinity	TDS	DO	Sulphate	Fluoride	Total Hardness	Chromium	Cadmium	Nickel
	^{0}C	-	NTU	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l
March 2013	22.3	7.37	2	8	30	4.7	7.9	0.53	24	<0.01	<0.01	0.02
April 2013	25.3	7.45	6	5	32	4.4	6.9	0.27	23	<0.01	<0.01	<0.01
May 2013	27.3	7.47	4	6	38	4.7	5.8	0.30	25	<0.01	<0.01	0.01
June 2013	28.2	7.52	5	9	35	4.6	6.4	0.25	25	<0.01	<0.01	<0.01

Station – 2 - Dhondibahar

Month & Year	Temperature	pH	Turbidity	Alkalinity	TDS	DO	Sulphate	Fluoride	Total Hardness	Chromium	Cadmium	Nickel
	^{0}C	-	NTU	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l	Mg/l
March 2013	21.4	7.82	6	11	38	4.8	7.9	0.28	29	<0.01	<0.01	0.02
April 2013	25.7	7.57	5	5	36	4.9	6.9	0.29	26	<0.01	<0.01	<0.01
May 2013	27.2	7.36	4	6	35	5.0	5.8	0.53	27	<0.01	<0.01	0.01
June 2013	28.3	7.22	3	8	37	4.6	6.4	0.30	27	<0.01	<0.01	<0.01

Alkalinity – Alkalinity of water is a measure of week acid present in it and of the cations balanced against them (Sverdrap et al., 1942). Total Alkalinity of water is due to presence of mineral salt present in it. It is primarily caused by the carbonate and bicarbonate ions (Singh et al., 2010). Alkalinity was range from minimum 5 mg/l and maximum 11 mg/l.

Total Dissolved Solids – Total dissolved solids of sample station ranging from minimum 30 mg/l to maximum 38 mg/l. Total dissolved solids in water samples are due to neutral organic substances mineral and suspended solids. Total dissolved solids values of the tested samples is very much below the WHO level of 400 mg/l and 500 mg/l respectively.

Dissolved oxygen – The value of DO fluctuates from minimum 4.4 mg/l to maximum 5.0 mg/l. The high DO in summer is due to increase in temperature and duration of bright sunlight has influence on the % of soluble gases (O_2 & CO_2). The long days and intense sunlight during summer seem to accelerate photosynthesis by phytoplankton, utilizing CO_2 and giving off oxygen. This possibly accounts for the greater qualities of O_2 recorded during summer. (Mishra et.al., 2009).

Sulphate - The Sulphate of sample stations ranged from minimum 5.8 mg/l to maximum .7.9 mg/l.

Fluoride – Fluoride Concentration is an important aspect of hydrogeochemistry, because of its impact on human health. The recommended concentration of fluoride in drinking water is 1.5.mg/l. The values recorded in this study was ranged between minimum 0.25 mg/l to maximum 0.53 mg/l.

Total Hardness – Total Hardness is the parameter of water quality used to describe the effect of dissolved minerals (mostly Ca and Mg). determining suitability of water for domestic, industrial and drinking purpose attributed to presence of bicarbonates, sulphates, chloride and nitrates of calcium and magnesium (Taylor, 1949). The variation in total hardness during study period at all sites was recorded as minimum 23 mg/l to maximum 29 mg/l.

Chromium (Cr) – Chromium (Cr) ranges minimum <0.01 mg/l to maximum <0.01 mg/l.
Cadmium (Cd) – Cadmium (Cd) ranges minimum <0.01 mg/l to maximum <0.01 mg/l.
Nickel (Ni) – Nickel (Ni) values ranges from minimum <0.01 mg/l to maximum 0.02 mg/l.

The data presented in table are the measured values of heavy metals concentrations of analyzed water sample collected of Ib river. A closer look at table suggests that there is a very less concentration of metals in the Ib river water. So these metals fall within the acceptable range for a river water as guided by WHO.

CONCLUSION
The present study concluded that river water of study area was not polluted in respect to analyzed parameters. Temperature, pH, Turbidity, Alkalinity, TDS, DO, Sulphae, Fluoride, and Total hardness were found within permissible limit. All metals Chromium (Cr), Cadmium (Cd) and Nickel (Ni) are very low in concentration. So the present study attributed river water was fit for drinking and other purpose.
Finally it is concluded that physico-chemical parameters and analysis of heavy metals of Ib river water is standard, indicate

that the water quality of downstream of Ib river water at Jashpur district, Chhattisgarh is fit for drinking as well as bathing without any satisfactory treatment

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