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ASSESSMENT OF ECOLOGICAL STATUS AND PHYSICAL DEGRADATION OF RIVER KANHAR IN BALARAMPUR DIST. CHHATTISGARH

M.R.Augar[1], Archana Tiwari[2] and Manish Upadhyay[3*]

[1]Assistant Professor, Govt.Agasen College Bilha, Bilaspur, Chhattisgarh, India.
[2]Research Scholar, Dr.C.V.Raman University Kargi Road, Kota, Bilaspur, Chhattisgarh, India.
[3]Prof & Head, Dr.C.V.Raman University Kargi Road, Kota, Bilaspur, Chhattisgarh, India.

ABSTRACT

Increasing urbanization and industrialization is causing stress to the water resources because of unlimited obstruction of water and discharge of industrial and municipal wastes into the same water bodies like river. Domestic or Industrial waste if discharged into River water can give rise to significant deterioration in its quality. Four different locations near Kanha River were selected for the study and compared. The parameters studied were pH, total alkalinity, total hardness, turbidity, chloride, sulphate, fluoride, total dissolved solids and conductivity. From overall analysis, it was observed that there was a slight fluctuation in the physico-chemical parameters among the water samples studied. Comparison of the physico-chemical parameters of the water sample with WHO and ICMR limits showed that the river water is slightly contaminated and account for health hazards for human use.

Key Words:- Industrialization, Deterioration, Municipal wastes, Parameters, Health hazards.

INTRODUCTION

The most important single substance for the continuation of life on this planet Earth is certainly none other than water. Water pollution is a major global problem which requires ongoing evaluation and revision of water resource policy at all levels (international down to individual aquifers and wells). It has been suggested that it is the leading worldwide cause of deaths and diseases, and that it accounts for the deaths of more than 15,000 people daily. APHA (1995) even though around 97% of earth surfaces is covered by water. An estimated 800 million Indians have no access to a proper toilet, and 1,000 Indian children die of diarrheal sickness every day.

Corresponding Author

Manish Upadhyay
E-mail: man_bsp@rediffmail.com

Some 70% of cities suffer from some degree of water pollution and nearly 600 million people lack access to safe drinking water. In addition to the acute problems of water pollution in developing countries, developed countries continue to struggle with pollution problems as well. The specific contaminants leading to pollution in water include a wide spectrum of chemicals, pathogens, and physical or sensory changes such as elevated temperature and discoloration.

While many of the chemicals and substances that are regulated may be naturally occurring (calcium, sodium, iron, manganese, etc.) the concentration is often the key in determining what is a natural component of water, and what is a contaminant. High concentrations of naturally-occurring substances can have negative impacts on aquatic flora and fauna. Oxygen-depleting substances may be natural materials, such as plant matter (e.g. leaves

and grass) as well as man-made chemicals. Other natural and anthropogenic substances may cause turbidity (cloudiness) which blocks light and disrupts plant growth, and clogs the gills of some fish species. Many of the chemical substances are toxic. Pathogens can produce waterborne diseases in either human or animal hosts. Alteration of water's physical chemistry includes acidity (change in pH), electrical conductivity, temperature, and eutrophication.

Eutrophication is an increase in the concentration of chemical nutrients in an ecosystem to an extent that increases in the primary productivity of the ecosystem. Depending on the degree of eutrophication, subsequent negative environmental effects such as anoxia (oxygen depletion) and severe reductions in water quality may occur, affecting fish and other animal populations (APHA 1995)

Study Area

Balarampur Dist. situated at 83° 62' 03" E Longitude and 23° 60' 67" N latitude with the 304.8 meter above sea level. Balrampur district is a part of Ambikapur (Surguja) division. It came into existence in 1st January 2012 and was earlier part of Surguja district. Underground water is the only source of water for the industrial areas. The ground and river water quality of Balarampur is continuously degrading due to industrial activities and the soils of the nearby fields are also being affected. Therefore, we have decided to analyze its river water so that some remedies for the improvement could be possible. (Figure 1) shows the study area and sampling locations.

MATERIAL & METHOD

Samples were collected from Kanha River in four different locations near during the post-rainy season (Oct-Nov 2015). Borosilicate glassware, distilled water and good quality reagents were used throughout the testing. Samples were collected in sterilized screw-capped polyethylene bottles of one litre capacity and analyzed in laboratory for their physico-chemical parameters. Samples collected from study sites were properly labeled and a record was prepared (Table 1). (Upadhyay M, 2014).

The various physiochemical parameters were analyzed (Table 2) and health effects of chemical parameters are reported (Table 3). Total alkalinities of the water samples were determined by titrating with N/50 H_2SO_4 using phenolphthalein and methyl orange as indicators. The chloride ions were generally determined by titrating the water samples against a standard solution of $AgNo_3$ using potassium chromate as an indicator. The conductivity of the water sample was measured using the conductometry method. The total hardness of the water samples was determined by complexometric titration with EDTA using Erichrome balck-T as an indicator. Sulphate and fluoride of the water samples were estimated by UV-visible spectrophotometer. TDS of water sample were measured using gravimetric method.

Table 1. Sampling points (river water)

Sampling place	Sampling point number
Mahavirganj	1
Bhanwarmal	2
Karoha	3
Dipadih	4

Table 2. Methods used for estimation of various physicochemical Parameters (Upadhyay and Shabir, 2014)

Parameters	Method
Temperature	Thermometer
pH	pH metry
Total Alkalinity	Conductometry
Total Hardness	EDTA Titration
Turbidity	Turbidity Meter
Chloride	Silver nitrate Method
Sulphate	Turbidometric Method
Fluoride Ion	spectrophotometer
Total Dissolved Solids	Conductivity Meter
Conductivity	Conductometry

Table 3. Health effects of chemical parameters (Singh V *et al.*, 2004)

Parameters of Water Analysis	Guideline values (Max. allowable)	Health Effects
pH	6.5-8.5	Affects mucous membrane; bitter taste; corrosion
Total Alkalinity	600mg/l	Boiled rice turns yellowish
Total Hardness	600mg/	Poor lathering with soap; deterioration of the quality of clothes; scale forming
Chloride	1000mg/l	Taste affected; corrosion
Sulphate	400mg/l	Taste affected; gastro-intestinal irritation
Fluoride	1.5mg/l	Dental and skeletal fluorosis; non-skeletal manifestations
Total Dissolved Solids	200mg/l	Undesirable taste; gastro-intestinal irritation; corrosion or incrustation

Table 4. Physico-chemical parameters of sampled waters

Parameters	1	2	3	4	5
Temperature (^{0}C)	-	-	-	-	-
pH	8.15	8.90	8.50	8.40	7.90
Total Alkalinity (mg/l)	95	90	110	105	123
Total Hardness (mg/l)	110	95	95	98	86
Nitrate (mg/l)	1.01	1.00	0.90	1.04	1.05
Chloride (mg/l)	102	90	120	98	80
Sulphate (mg/l)	60	61	50	71	58
Fluoride (mg/l)	0.90	1.0	1.10	1.15	1.10
Total Solids (mg/l)	575	598	570	555	560
BOD	10	15	16	9	10

Figure 1. Chhattisgarh state map

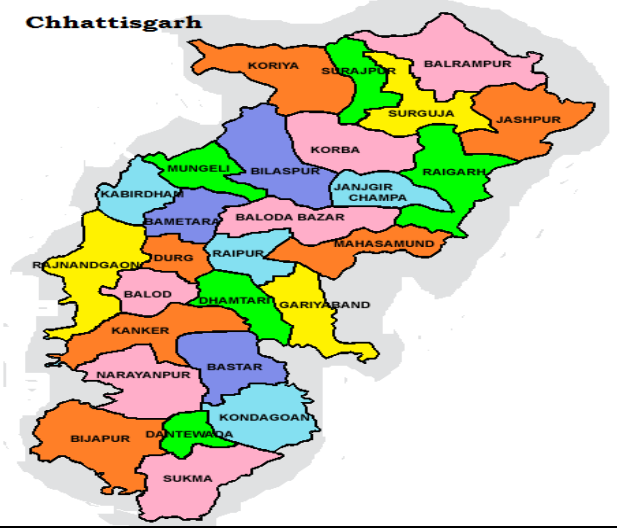

Figure 2. Balrampur district map

RESULT & DISSCUSSION

The sample collected from Kanha River. The analysis (Table 3) of ground water samples includes the determination of concentration of inorganic constituents. The physico-chemical parameters, which were analyzed in post rainy season Oct-Nov 2015, 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 7.90 to 8.90. On an average, pH of all samples was in desirable limit as prescribed for

drinking water standard. This shows that pH of water sample was slightly alkaline (Sorg IJ *et al.*, 1998). Total alkalinity of water in terms of $CaCO_3$ varied from 90-123 mg/l. The values of total alkalinity were comparatively moderate. The water for domestic use having alkalinity less than 100mg/l is safe (Upadhyay, 2014). The high content of alkalinity is shown in the Table 4. Total hardness was found in the sample water ranges from 86-110mg/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 (Kumari and Upadhyay, 2013) and more than 300 mg/l as very hard. On this basis, the results show that all the samples were soft except sample 01 (Upadhyay *et al.*, 2013).

Chloride content of the water samples was low in rainy season. According to WHO, maximum permissible limit for chloride is 500mg/l. The value observed in present study is in the range of permissible limit (Fig.3). The sulphate content varies between 50 to 71 mg/l and the fluoride content varies between 0.9 to 1.5 mg/l. The sulphate and fluoride values were also found to be within the prescribed limits. 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, 2004). The observation shows that the TDS is within the permissible range as prescribed by WHO (2004).

CONCLUSION

The results of river water investigation show that the waters of the study area are slightly contaminated with total solids. As a result of high concentration of TS, water loses its portability and reduces the solubility of oxygen in water. Water of almost all study points is hardened contaminated because of this, people of Balarampur area are prone for the immediate health problems such as stomach diseases, gastric troubles etc.

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CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest.

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