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PHYSICOCHEMICAL AND HEAVY METAL ANALYSIS OF POND WATER QUALITY OF RAIPUR CHHATISHGARH (INDIA)

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ABSTRACT

Surface Water is an important source of water which is commonly used for multiple uses such as in agriculture, drinking purposes, small scale industrial application, and for household works. Due to rapid industrial growth, population explosion, and increased fertilizer application the surface and ground water have been continuously polluted, water pollution is caused by textile industry is mainly by release of waste stream coming out from wet processing operations line scouring bleaching dyeing and painting etc. Due to this chemical pollution the normal functioning of cell is disturbed and this is turn may cause alternation in physiology and biochemical mechanism. In the present study, monitoring and assessment of some physiochemical parameter of different pond water of Raipur area has been carried out to decipher the pollution load in the fresh water ecosystem. Several physiochemical parameters such as turbidity, salinity, total hardness, DTS, DO, BOD, COD, water samples were Analyzed for 5 metal Mo, Co, Zn, Fe, Cr.

KEYWORDS: Water quality, Pond water, Agricultural runoff, Urban discharge, Fertilizer release.

INTRODUCTION

Surface water is vital source for agriculture, drinking purpose, industrial activities, and for major hydrological operations as it is easily available throughout the globe. In india major portion of surface water is used for irrigation purpose in agricultural fields. Surface water is generally located in ponds, rivers, lakes, reservoirs, dams, and wetlands.[1] Due to rapid industrialization and urbanization coupled with increased population growth have tremendously damaged the aquatic environment.[2,6] The demands of production of increased food grains have challenging effect on agricultural community and to produce more food grains many agricultural farmers use chemical fertilizers, pesticides, and rodenticides.[7] Consequently the excess uses of fertilizers and pesticides splash away into the near aquatic bodies. Urban wastewater discharge by the sewer pipeline has direct effect on water ecosystem of natural ponds, lakes, wetlands, and rivers. Agricultural water discharge after the fertilizer application may contain recalcitrant organic pollutants and heavy metals.[8,9] Sewage wastewater may contain dyes, heavy metals, organic recalcitrant pollutants, polyaromatic hydrocarbons, and harmful microbial organism. Industrial wastewater discharge frompaint industry, battery manufacturing, metallurgical processes, and plastic industry may contain toxic heavy metals.

In the present study, monitoring and assessment of some physiochemical parameters of different pond water of mauaima area (Raipur district, India) has been carried out to decipher the pollution load in the fresh water ecosystem.

Experimental Analysis

Study Area

Mauaima is block in the Raipur district of Chhatishgarh, India. The study area witnessed an exponential growth of population and the resultant anthropogenic pressures on water resources. Dense human population in the study area, urbanization, growth in small and medium industries, and various anthropogenic activities caused increased inflow of slit, untreated sewage, nutrients, heavy metals and pesticides from urban and rural areas, thus adversely affecting both the water quality and quantity. Most of the population in the study area is involved in the agricultural activities which uses high grade fertilizers and brick kilns. The area is also a hub of small and mediumscale firecracker industries producing huge amount of firecrackers during the festival sessions.

Water sample collection

Different water samples(total 15) were collected from five pond of the mauaima area of Raipur district(Chhatishgarh, India). Water samples were collected in the March 2016 from the selected ponds 10 cm below the surface of water using the fresh plastic bottles. The collected samples were brought to the laboratory for physiochemical analysis. All the collected samples were preserved and analyzed as per standard

methods for the Examination of Water and Wastewater published by APHA, 21st edition.[10] Onsite measurements of water temperature, dissolved oxygen (DO), and pH were perfromed with the help of multi-parameter water analysis kit, respectively. Heavy metals analyses were perfromed on acid digested water samples with atomic absorption spectrophotometer (ECIL AAS 4141, Hyderabad, India). The digestion was carried out with nitric and perchloric acid mixture.

RESULT AND DISCUSSION

Temperature of water

Samples of water were collected from different areas and for each samples the temperature were determined with the help of water analysis kit. The temperature of water sample collected in the month of January and February falls in the range 23 to 25 0C it is increasing to know that salinity of water collected from Paloud pond Raipur. Raipur is highest where as it is lowest in the water collected from central Bandha pond Raipur.

pH

Water samples were collected from different areas and for each samples the pH content were determined with the help of water analysis kit. Examination of pH values of all the water samples reveals that all water sample are alkaline in nature. The pH value 8.93 of Chherka pond is highest, whereas the water collected from Bandha pond has lowest pH value 7.40.

Conductivity and Total dissolved solid (TDS)

Water samples were collected from different areas and for each samples the conductivity and T.D.S were determined with the help of water analysis kit. There is variation in conductivity of water collected from five different places. Similarity there is a variation in the value of T.D.S. in all the five samples. I t is interesting to note that when the T.D.S. is highest, the value of conductivity is also highest and similarly when T.D.S. is lowest the conductivity is also lowest. In order to find out relationship between these two parameters the corrleation coefficient was calculated using the following formula. Taking value of x_i and y_i from table. The correlation coefficient obtained as 0.96.

Salinity of water

Samples of water were collected from different areas and for each samples the salinity contact where determine with the help of water analysis kit. Perusal of data given in table reveals that in the water sample salinity is quite low and varies from 0.60 to 0.92 ppt.

Turbidity of Water

Samples of water were collected from different areas and for each samples the turbidity content were determined with the help of water analysis kit perusal of data given in table revels that water sample collected from Bandha pond has lowest (32 NTU) Turbidity where as, the water sample collected from Paloud pond has highest value (52.85 NTU) of turnidity.

The turbidity value of 3 samples are varies in the range 38.11 to 47.51 NTU

Chloride

Samples of water were collected from different areas and for each samples the chloride contents were determined with the help of water analysis kit.

There is a large varions in the chloride ion content of water in 5 sample.

In other hand the waters collected from Kotni pond has the lowest value of chloride ion content which is 35.5 mg/lit to higest value of chloride ion content in water sample content collected from Chherka pond this is 86.90 mg/lit.

Table 1: Physico-chemical parameters of measured water samples from different pond water.

SNO	Sampling station	Temperature ·C	pH	Conductivity (mS)	TDS	Salinity (mg/lit)	Turbidity	Chloride
1	Bandha pond	23	7.40	4.04	177	0.61	32	63.90
2	Paloud Pond	25	8.93	9/77	464	0.92	26.09	49.27
3	Kotani pond	23.5	8.80	4.28	247	0.90	52.85	80.90
4	Chherka pond	23.9	7.45	5.94	326	0.74	40.01	86.90
5	Kuhera pond	24.2	7.96	4.55	219	0.69	45.81	35.50

Table 2: Total hardness and total alkality of measured water samples.

SNO	Sampling station	Hardness mg/lit	Calcium mg/lit	Magnesium mg/lit	Total Alkalinity mg/lit
1	Bandha Pond	320	96	46.5	72.5
2	Paloud Pond	480	90	126	100
3	Kotani pond	392	48	124	124
4	Chherka pond	240	66	45.5	180
5	Kuhera pond	300	106	37	95

Total Hardness

Samples of water were collected from different areas and for each samples the hardness, calcium contents and magnesium content were determined by EDTA titration. Using the procedure given in below table.

The total hardness of water collected from different places varies in the range 240 mg/lit to 480 mg/lit.

The highest being in the water collected from Paloud pond and the lowest pond from Chherka pond, except for samples of Kotni pond of and Bandha pond the Mg content of water is more or less same.

Where as the value of samples of Kotnipond and Bandha pond is quite highest.

However there us variation in calcium content in all the samples.

The measured concentration of total alkalinity in water samples were in the range of 72.5 to 180 mg/lit.

The lowest total hardness of 72.5 mg/lit, was found in Bandha pond water and highest concentration of 180 mg/lit was observed for Chherka pond. Table 2.

Dissolved Oxygen (DO) and biological oxygen demand BOD

Samples of water were collected from different areas and for each samples the DO and BOD contents were determined by WINKLERS method using the procedure given below in table 3.

The DO varies from 2.8 mg /lit to 5.2 mg/lit where as BOD varies from 1.2 mg/lit to 2.7 mg/lit.

Chemical Oxygen Demand (COD)

Samples of water were collected from different areas and for each samples the COD contents were determined by REFLUX method.

Table 3 shows that DO, BOD and COD values for the measure water samples.

The lowest value of DO was found in Paloud pond water and highest was for Bandha pond which is 2.8 and 5.2.

S No	SAMPLKNG STATION	DO mg/lit	BOD mg/lit	COD mg/lit
1	Bandha pond	5.2	1.2	6.8
2	Paloud Pond	2.8	2.7	20.8
3	Kotni pond	4.8	2.5	7.5
4	Chherka pond	3.2	1.4	16

Metal Ion

Metal ions contamination in pond water is mainly due to the minerals weathering, sewage discharge agriculture fertilizers and from waste water effluent. Some heaving metals, ions that is Zn and Cu are extremely essential to human life, but if present in large quantity may cause physiological disorder. Cd, chromium and lead are highly toxic in trace concentration.

The average heavy metals concentrations in pond water were found to be exceeding the permissible limit as mentioned by central pollution control board.

Table 4 shows the average metal ions concentration in different pond water.

The main sources of contamination include soil weathering, municipal waste water, urban runoff and industrial wastewaters.

S BI	SANOKUBG SUTE	METAL IONS				
		Cd	Cu	Pb	Cr	Zn
1	Bandha pond	0.45	0.87	0.50	1.48	1.34
2	Paloud Pond	0.76	1.05	0.67	1.54	1.78
3	Kotnipon	0.63	0.66	0.43	0.77	2.37
4	Chherka pond	0.57	0.82	1.12	0.98	2,6
5	Kuhera pond	0.70	1.10	0.92	1.74	1.84

CONCLUSION

The measurement of water samples collected from different places of water quality of Bandha pond and Raipur is better in quality from the point of view of small values of TDS turbidity and conductivity.

Further the Mg content of water in also very good, do is higher and COD is also low.

The water sample obtained from PALOUD pond showed the highest value of turbidity.

Its shows highest value of mg ion but DO is quite low and salinity is highest of this water.

The TDS is also very high for Paloud pond water. Heavy metals analysis show that the water quality is not suitable for drinking and household purposes due to high level of metal ions. The concentration of metal ions such as Cd, Cu, Pb, Cr, and Zn where higher as prescribed for drinking and household activiites.

Raipur is much better in quality and the water collected fromPaloud pond is poor in quality.

The result of this study suggest that there is urgently need to check the discharge of untreated wastewater from house hold and agricultural runoff to near water bodies.

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