



STUDY OF PHYSICO-CHEMICAL PROPERTIES OF SURFACE WATER (SHIVNATH RIVER & PONDS) IN DURG AND RAJNANDGAON REGION

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ABSTRACT

An investigation was undertaken to determine the Quality of surface water of shivnath river & ponds in durg and rajnandgaon region". The study assessed the evolution of water quality in Surface of Durg and Rajnandgaon district. A comparative study of both type of surface water i.e. river as well as pond water was carried out by taking certain important parameters like temperature, pH, Total dissolved solids, alkalinity, dissolved oxygen, chloride and the same were compared with drinking water standard IS:10500,2005. In this present investigation it was found that the maximum parameters were not at the level of pollution. So both type of surface water satisfy the requirement for the use in various purposes. But the study of pond water indicated that the community ponds are highly polluted and unsafe for human use. Temple pond is comparatively less polluted than small community pond and large community pond.

INTRODUCTION

Water covers 70.9% of the Earth's surface, and is vital for all known forms of life. On Earth, 96.5% of the planet's water is found in oceans, 1.7% in groundwater, 1.7% in glaciers and the ice caps of Antarctica and Greenland, a small fraction in other large water bodies, and 0.001% in the air as vapor, clouds (formed of solid and liquid water particles suspended in air), and precipitation. Only 2.5% of the Earth's water is fresh water, and 98.8% of that water is in ice and groundwater. Less than 0.3% of all freshwater is in rivers, lakes, and the atmosphere, and an even smaller amount of the Earth's freshwater (0.003%) is contained within biological bodies and manufactured products. Water on earth moves continually through the hydrological cycle of evaporation and transpiration

(evapotranspiration), condensation, precipitation, and runoff, usually reaching the sea [1, 2, 3]. Evaporation and transpiration contribute to the precipitation over land. Safe drinking water is essential to humans and other life forms. Access to safe drinking water has improved over the last decades in almost every part of the world, but approximately one billion people still lack access to safe water and over 2.5 billion lack access to adequate sanitation [4, 5]. There is a clear correlation between access to safe water and GDP per capita. However, some observers have estimated that by 2025 more than half of the world population will be facing water-based vulnerability [6-8]. A recent report (November 2009) suggests that by 2030, in some developing regions of the world, water demand will exceed supply by 50%. Water plays an important role in the world economy, as it functions as a solvent for a wide variety of chemical substances and facilitates industrial cooling and transportation. Approximately 70% of the fresh water used by humans goes to agriculture. So an investigation was

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undertaken to determine the Quality of surface water of shivnath river & ponds in durg and rajnandgaon region” by analyzing various Physico chemical parameters [9, 10].

STUDY AREA

Durg District is a populous District of Chhattisgarh. It occupies the southwestern part of the Chhattisgarh plain and possesses belts of hilly country in the south, southwest and northwest, bestowed with mineral resources and forests [11, 12, 13].

Geographical Informations are as followed

Latitude & Longitude: Between- 20°23' and 22°02' N & 80°46' and 81°58 E

Height above mean sea level: 317.00 M

Geographical Area: 8537 km²

Forest Area: 764.46 km² (8.95% of Geographical Area)

The District occupies the southwestern part of the Upper Sheonath-Mahanadi valley and the bordering hills in the south and southwest. Physiographically, the District can be divided into two divisions, viz. the C.G. plain and the Southern plateau. The Chhattisgarh plain occupies the largest area in the District [14, 15].

Rajnandgaon is located at 21.10°N 81.03°E in Chhattisgarh. It has an average elevation of 307 metres (1010 feet) The district covers an area of 8222 km². The district is bounded by Kabirdham district in the north, Durg district in the east, Bastar district in the south, Gadchiroli and Bhandara districts of Maharashtra state and Balaghat district of Madhya Pradesh state in the west.

RESULTS AND CONCLUSION

Table 1. The List of parameters analyzed and Drinking water standards

PARAMETERS	METHOD USED	TOLERANCE LIMIT*	
		Drinking	Inland waters
Physical:			
Turbidity, NTU	Turbidity tube method	10	-
Water temperature, °C	Temperature sensitive probe	-	40
EC, m S/cm	Electrometric method	-	-
TDS, mg/L	Electrometric method	500	200
pH	Electrometric method	6.5 to 8.5	5.5 to 9.0
Chemical			
Free CO ₂ , mg/L	Titrimetric method	-	-
DO, mg/L	Winkler's iodometric method	6.0	3.0
Chlorides, mg/L	Titrimetric method	250	1000
Total alkalinity, mg/L	Titrimetric method	200	-
Total hardness, mg/L	Titrimetric method	300	-

* - The tolerance limit is as prescribed by the Indian Standards Institution (IS 10500-1989)

Rajnandgaon, city, central Chhattisgarh state, central India, lying just north of the Seonath River [16].

Selection of Sampling Points

The sampling points were selected so as the water samples represent the entire river and pond. The parameters such as pH, Temperature (Water and Air), Electrical Conductivity, Total Dissolved Solids and Dissolved oxygen were analysed in the sampling spots. The water samples for physico-chemical analysis were collected simultaneously in all sampling points. The water for physico-chemical analysis was collected in 1-liter plastic cans [17, 18].

Sample Analysis

The various physical (pH, Temp. Conductivity, TDS, Turbidity) and chemical parameters (D O, Free Co₂, Chloride, Alkalinity, Hardness, Sulphate and Nitrate) of collected samples were analyzed by following standard methods. Study of the Physical parameter (pH, Temp. Conductivity, TDS, Turbidity) of collected water samples were determined using physical equipments like Thermometer, pH meter, conductivity meter, water analyzer kit. Analysis of Chemical parameter (D O, Free Co₂, Chloride, Alkalinity, Hardness.) of collected water samples were determined by different chemical means [19, 20, 21]. That is, D.O. by Winkler titration method, Free CO₂, Hardness, Alkalinity by Titrimetric method, Chloride by Argentometric method [22, 23].



Table 2. Analysis results of Physical and chemical parameters of Shivnath River and ponds of Durg and Rajnandgaon city water

Areas taken for analysis	Temp. °C	pH	TDS mg/lit	Alkalinity mg/lit	Hardness mg/lit	D.O mg/lit	Chloride mg/lit	EC Ω^{-1}	Turbidity (NTU)
Shivnath river	27.2	7.34	723.89	338	350	4.8	172.7	1067	28.4
Luchki talab	28.6	7.4	683.60	230	165	3.6	72.3	794	26.5
Ramnagar talab	27.7	7.25	483.71	210	70	4.2	63.25	648	9.6
Santoshi talab	27.4	7.3	382.45	310	135	3.8	80.85	701	11.2
Polsay talab	29.3	7.2	420.53	243.5	125	4.0	76.03	962	8.3
Shankarnagar talab	28.5	7.39	465.29	315	77	4.3	90.53	689	5.6
Shankarpur talab	28.9	7.3	391.95	225	130	3.9	78.1	603	6.4
Pinky talab	27.9	7.7	486.85	315	60	4.5	81.65	749	24.0
Ranisagar talab	27.4	7.23	704.6	305	40	4.3	166.85	1084	9.3
Budha talab	27.6	7.1	416	247.5	70	3.9	53.25	640	8.6
Moti talab	28.3	7.7	390.65	360	150	4.3	60.35	601	1.9
Indira sarovar	27.4	7.7	633.1	270	120	4.4	120.7	974	2.6

CONCLUSION

The study assessed the evolution of water quality in ground water and pond water of Durg and Rajnandgaon district. A comparative study of both type of ground water i.e. river as well as pond water was carried out by taking certain important parameters like temperature, pH, total dissolved solid, alkalinity, dissolved oxygen, chloride. In

this present investigation it was found that the maximum parameters were not at the level of pollution. So both type of surface water satisfy the requirement for the use in various purposes. But the study of pond water indicated that the community ponds are highly polluted and unsafe for human use. Temple pond is comparatively less polluted than small community pond and large community pond.

REFERENCES

- Kumar N. (1997). A View on Freshwater environment. *Ecol. Env & Cons*, 3, 3-4.
- Tiwari TN and Mishra M. (1986). Pollution in the river Ganga at Varanashi. *Life Science Advances*, 5, 130-137.
- Tiwari TN and Ali M. (1987). River pollution in Katmandu valley variation of water quality index. *JEP I*, 347-351.
- Reddy PM and Venkateswar V. (1987). Assessment of water quality in the river Tungabhadra near Kurnol. *A.P.J. Environ. Biol*, 8, 109-119.
- Khulab RD. (1989). Prospective in aquatic biology". Papyrus Pub. House, New Delhi.
- Vollenweidre RA. (1986). Scientific fundamental of the eutrophication of lakes and flowing waters with special reference to nitrogen and phosphorus, as factoring eutrophication". O. E C. D. Paris.
- National Academy of Science. Eutrophication causes consequences and correctives. Nat.Acad. Sci. Washington, D.C.
- Milway CP. (1969). Educational in large lakes and impoundments. Proc.Upplasale Symp. DECD Paris.
- Olimax T and Sikorska U. (1975). Field experiment on the effect of municipal sewage on macrophytes and epifauna in the lake littoral. *Acad. Pol. Sc. Clii*, 23, 445-447.
- Piecznska T, Usikorna E and Olimak T. (1975). The influence of domestic sewage on the littoral zone of lakes. *Pol. Arch. Hydrobiol*, 22, 141-156.
- Mahananda HB, Mahananda MR, and Mohanty BP. (2005). Studies on the Physico-chemical and Biological Parameters of a Fresh Water Pond Ecosystem as an Indicator of Water Pollution. *Ecol. Env & Cons*, 11(3), 537-541.
- Moore PD, Daniel TC, Gilmour JT, Shereve BR, Edward DR, and Wood BH. (1998). Decreasing Metal Runoff from Poultry Litter with Aluminium Sulfate. *J. Env. Qual*, 27, 92-99.
- Kumar A. (1995). Periodicity and Abundance of Plankton in Relation to Physico-Chemical Characteristics of Tropical Wetlands of South Bihar. *Ecol. Env. and Cons*, 1, 47-54.



14. Gay and Proop. (1993). Aspects of River Pollution, Butterworths Scientific Publication, London.
15. Vollenwider RA. (1998). Water Management research. Scientific fundamentals of the of the eutrophication of lakes and flowing waters with particular reference to nitrogen and phosphorus as factor in eutorophication. 1, 45-72.
16. Muller BA. (2001). Residential Water Source and the Risk of Childhood Brain Tumors. *Env. Health. Perspt*, 6, 109.
17. Parivesh PG. (2003). Groundwater. *Ed. Dilip Biswas*, 1, 1-3.
18. Veslind PG. (1993). National Geographic Senior Writer. *National Geographic*, 183, 5-8.
19. Zaman CL. (2002). A Nested Case Control Study of Methemoglobinemia Risk Factors in Children of Transylvania, Romania. *Env. Health Perspt*, 10, 02.
20. Trivedy RK. (1990). Physico-Chemical Characteristics and Phytoplankton of the River Panchganga Near Kolhapur, Maharastra. *River Pollution in India* (Ed. R.K. Trivedy) Ashish Publishing House, New Delhi, 159-178.
21. Welch. (1952). *Limnology* 2nd Edn. McGraw Hill Book Co, New York.
22. APHA. (1989). Standard method for examination of water and waste water, American Public Health Association, Washington, D.C.
23. WHO. (1972). World Health Organisation.

