

Study of Physico- chemical Characteristics of Water in River Mandakini

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Abstract: The physico-chemical parameters of water samples collected from river mandakini at various locations of chitrakoot District were assess. Physico-chemical parameters like, Temperature, pH, Alkalinity, TDS, Chloride, Total Hardness, Sulphate and Phosphate was determined. The river mandakini originates near village kalhura in the majhgawan block, district Satna of Madhya Pradesh at latitude $24^{\circ}52'N$ and longitude $80^{\circ}41'E$. The results were compared with standards prescribed by WHO (1984). Temperature, pH, Chloride, Sulphate and phosphates of all the samples were found below the permissible limit set by WHO. It is concluded that the water of river is not highly polluted but there is an indicating of increasing pollutant due to anthropogenic activities. Proper monitoring is needed to avoid anthropogenic contamination.

Keywords: Physico-chemical Parameters, River water, River Mandakini, Chitrakoot District

1. INTRODUCTION

The river mandakini originates near village kalhura in the majhgawan block, district Satna of Madhya Pradesh at latitude $24^{\circ}52'N$ and longitude $80^{\circ}41'E$. The river flows generally in a south to north direction, through in the first and last reaches a west to east trend is also significant. The river flows in Madhya Pradesh for about 25 km, then makes a border of district Satna (Madhya Pradesh) and district chitrakoot (Utter Pradesh) for next 25 km and again enters in Madhya Pradesh just downstream of Sati Anusuiya, After flowing through about 15 km more in M.P., it crosses into Utter Pradesh near Ramghat in chitrakoot area and later flows only in Utter Pradesh finally it joins river Yamuna near Rajapur^[1].

India is a country having land forms and rivers. There are 14 major rivers in India. The rivers of India play an important role in the lives of the Indian people. The river systems provide irrigation, potable water, electricity and the livelihoods for a large number of people all over the country.^[2-5]

Water is the most important in shaping the land and regulating the climate. It is one of the most important compounds that profoundly influence life. The quality of water usually described according to its physical, chemical, characteristics. Rapid industrialization and indiscriminate use of chemical fertilizers and pesticides in agriculture are causing heavy and varied pollution in aquatic environment leading to deterioration of water quality and depletion of aquatic biota. Due to use of contaminated water, human population suffers from water born diseases. It is therefore to check the water quality at regular interval of time^[6]. The present study is an attempt to make an assessment of the change in the quality of water of river mandakini by the addition of urban waste of chitrakoot city. An attempt has been made to study the extent of change in the quality of water in comparison to water quality standards of world health organization, (WHO, 1984).

2. MATERIALS AND METHODS

Physico-chemical characteristics of water in river Mandakini is conducted during month of April 2013. Location of the sampling station were given below the table-1. Sampling was done accordance with Grab sampling method in polyethylene bottles of one liter capacity to avoided leaching of metals and interaction with the surface wall of the container, bottles were first cleaned with detergent and then soaked in 1:1 HNO₃ for 24 hours. Finally the bottles were cleaned and rinsed with distilled water^[7]. During sampling bottles were rinsed two to three times with the samples to be examined before filling with it. Samples were collected by immersing the rinsed bottles in river waters. All the samples were labeled showing the source date and time of collection. The samples were labeled, showing the

source date and time of collection. The samples were refrigerated at 4°C in the laboratory [8-11]. The Procedures followed to analyze the Heavy metal concentration were from Standard Methods (APHA 1984).⁷

3. RESULT AND DISCUSSION

The water samples were analysed some parameter like Temperature, pH, Alkalinity, Chloride, TDS, TH, Sulphate, and Phosphate. Analysed all the results are presented in **Table-1** and drinking water standard values are presented in **Table-2** Graphical representations of the data were shown in **fig-1-8**.

The present research works identify Physico-chemical characteristics of water of River Mandakini in Chitrakoot Rigion. The results of water quality of River Mandakini in Chitrakoot are given below.

3.1. Temperature

Temperature is an important factor, which regulates the geo chemical activities in the aquatic environment. Temperature of Mandakini river water range 26°C from to 33°C. The maximum temperature was recorded 33°C at sampling location M₄ and the minimum temperature is 26°C in Chitrakoot river Mandakini water. [12] Tripathi *et al.* 2016, Physico-chemical characteristics of surface water samples collected from river mandakini at chitrakoot region, found the temperature ranged between 28°C to 35.2 °C.

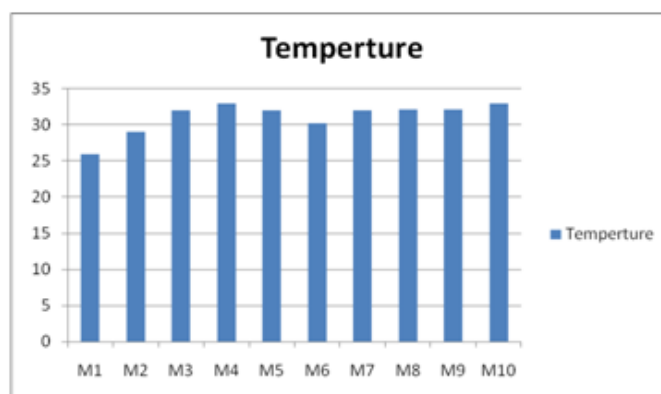


Figure1. temperature at various locations of River Mandakini

3.2. pH

The pH value of water sample are between 6.1to 7.0. All the results were below the permissible limit prescribed by WHO (1984) as 8.5 mg/l. The highest pH was absorbed of sampling location M₉ (7.0) while the lowest pH was detected at sampling location M₅ (6.1). [13] Tripathi *et al.* 2016 physico-chemical Studies on ground water and surface water in and around katni city, Madhya Pradesh and observed the pH concentrations ranged from 6.9 to 8.1.

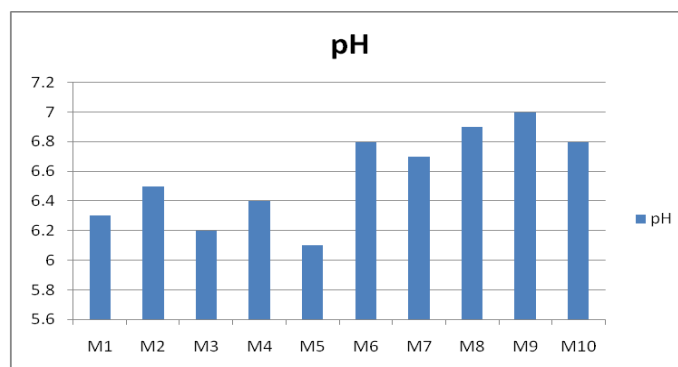


Figure2. pH at various locations of River Mandakini

3.3. Alkalinity

Alkalinity is a measure of the concentration of such ions in water that would react to neutralize hydrogen ions. Abnormally high alkalinity imparts bitter test to water and makes it unpalatable. In present study lowest value of alkalinity was found 210 mg/l and higher value found 500 mg/l. The highest Alkalinity was absorbed of sampling location M₄ (500) while lowest Alkalinity was detected at sampling location M₅ (210 mg/l). [14] Kamboj *et al.* 2015, carried out quality assessment of municipal

supplied water for drinking purpose, district Haridwar, Uttarakhand, India, have reported Alkalinity ranged between 210 to 249 mg/l. Alkalinity in water comes from calcium carbonate, CaCO_3 , being leached from rocks and soil.

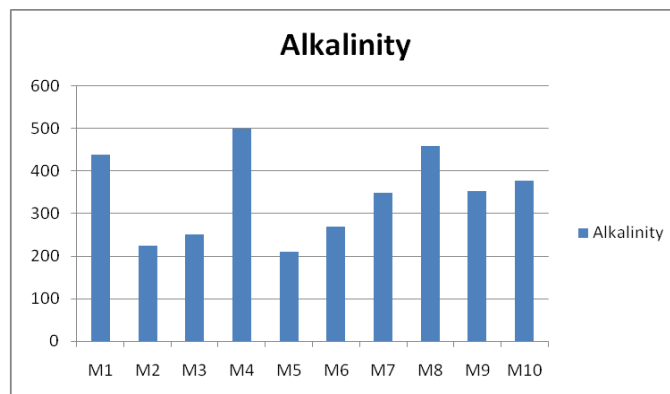


Figure3. Alkalinity at various locations of River Mandakini

3.4. Chloride

Chloride occurs naturally in all types of water. Chloride is soluble in water and moves freely with water through soil and rocks. Chloride salts in excess of 100 mg/l give salty taste to water. In this work highest value of chloride 555 mg/l and lowest value is 85 mg/l. ^[15] Tripathi *et al.* 2013 studied characterization of diffuse chemical pollution in Satna District of Vindhya Region, India, Chloride concentration was analyzed and found the chloride content ranged between 5.0 to 82.0 mg/l.

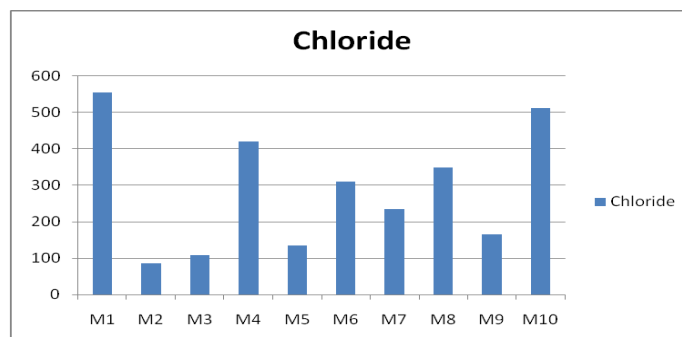


Figure4. Chloride at various locations of River Mandakini

3.5. Total Dissolve Solid

In natural water, total dissolved solid (TDS) are composed mainly of carbonate, bicarbonate, chloride, sulphate, phosphate, nitrate, Ca, Mg, Na, K, Fe, Mn etc., (Esmæili and Johal,2005). Pond water samples with a high total dissolved solids indicated more ionic concentration, which is of inferior pot ability and can induce an unfavorable physic-chemical effect in the consumers. In the present study TDS was found 118 to 548 mg/l. Maxmium TDS (548 mg/l) was detected at sampling station M_{10} (Karvi). ^[16] Zinjad *et al.* 2013 carried out physic-chemical parameters of drinking water in parvara areas around parvara and TDS value was found ranged between 481-655.0 mg/l.

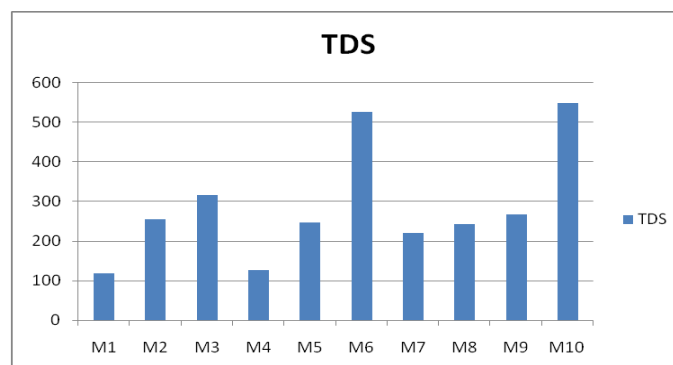


Figure5. TDS at various locations of River Mandakini

3.6. Total Hardness

In present study of TH highest value found 621 mg/l and lowest value found 249 mg/l. Most of stations were found higher values of hardness. [17] Sharma *et al.* 2013 study in physic-chemical analysis of surface and ground water of abhanpur block in Raipur district, Chhattisgarh, studied the water hardness ranged from a 130 to 280 mg/l.

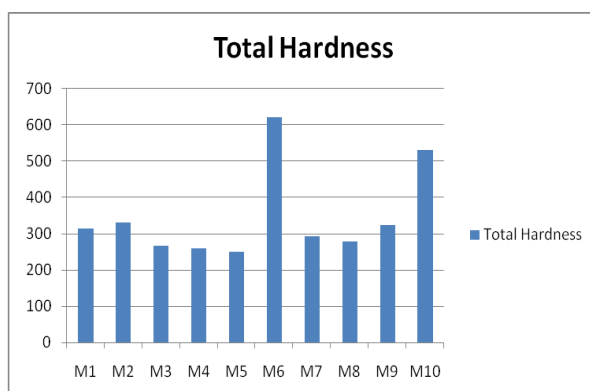


Figure6. Total Hardness at various locations of River Mandakini

3.7. Sulphate

Sulphate is naturally occurring anion in all kinds of natural waters. The sulphate concentration ranged from 4 to 43 mg/l. The maximum concentration was detected at sampling location M8 (43) while minimum concentrations sampling location M2 (4mg/l). All the results were below the permissible limit prescribed WHO (1984) 250 mg/l. [18] Tripathi *et al.* 2016, statistical assessment of surface water resources in east zone of central India and reported the sulphate concentrations ranged between 0.003 to 6.0 mg/l.

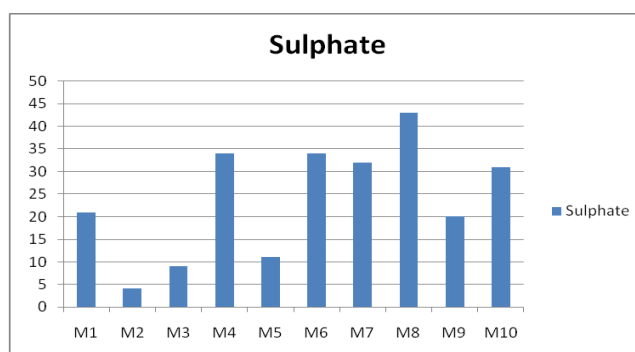


Figure7. Sulphate at various locations of River Mandakini

3.8. Phosphate

The permissible limit of [19] USPHS for phosphate is 0.1 mg/l. all the collected samples have phosphate concentration ranging from 0.00 to 0.009 mg/l. all the water samples of phosphate concentration are under the limit of [20] USPHS as 0.1 mg/l. [21] Prasanna *et al.* 2010, studied physico-chemical properties of water collected from Dharma Estuary and analysed the phosphate content and values were found ranged between 0.04 to 1.15 mg/l.

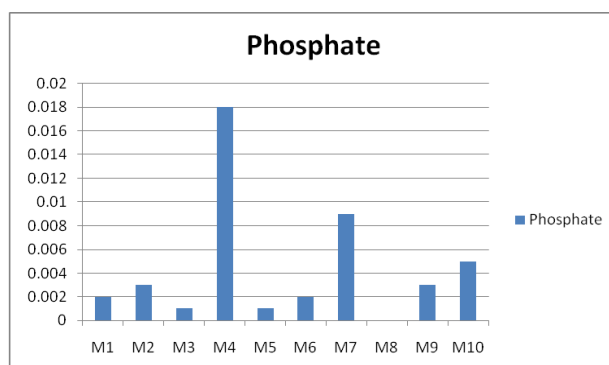


Figure8. Phosphates at various locations of River Mandakini

Table1. The Physico-chemical Characteristics of River water from Different Locations of Chitrakoot

Sampling station	Temperature	pH	TDS	Alkalinity	Chloride	Total Hardness	Sulphate	Phosphate
M ₁	26	6.3	118	439	555	315	21	0.002
M ₂	29	6.5	256	225	85	330	4	0.003
M ₃	32	6.2	316	250	109	266	9	0.001
M ₄	33	6.4	126	500	420	260	34	0.018
M ₅	32	6.1	246	210	134	249	11	0.001
M ₆	30.2	6.8	527	270	310	621	34	0.002
M ₇	32	6.7	221	350	234	294	32	0.009
M ₈	32.2	6.9	243	460	350	278	43	0.00
M ₉	32.2	7.0	267	354	165	325	20	0.003
M ₁₀	33	6.8	548	378	513	532	31	0.005

M₁=Sfaticshila, M₂=Nagaji, M₃=Arogyadham, M₄= Jankikund, M₅=Siyaram Kuteer, M₆=Ramghat,, M₇=Sitapur, M₈=Sonepur, M₉=Karvi, Sonepur Ke Medium Me, M₁₀= Karvi

Table2. WHO Guideline for Drinking Water Quality.1984

Parameter	Standard value
pH	6.5- 8.5
Total Hardness	300 mg/l
TDS	200-250 mg/l
Alkalinity	600
Chloride	250 mg/l
Sulphate	200 mg/l
Phosphate	0.1mg/l

4. CONCLUSION

In the present study analyzed physico-chemical properties of River Mandakini from the Chosen selected sampling locations. Samples were collected determined the following parameters Temperature, pH, Alkalinity, TDS, Total Hardness, Chloride, Sulphate and Phosphate. The Temperature values were found 26^oC to 33^oC .pH6.1 to 7.0, Alkalinity 210to 500 mg/l., Chloride 5.0 to 82 mg/l, TDS 118 to 548 mg/l, Total Hardness 249 to 621 mg/l, Sulphate 4.0 to 43 mg/l. and phosphate 0.00 to 0.009 mg/l. Same samples of Alkalinity , Total Dissolve Solid and Total Hardness were found more than the permissible limit prescribed by WHO(1984).Temperature, pH, Chloride, Sulphate and phosphates of all the samples were found below the permissible limit set by WHO ^[22]. It is concluded that the water of river is not highly polluted but there is an indicating of increasing pollutant due to anthropogenic activities. Proper monitoring is needed to avoid anthropogenic contamination.

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