International Journal of Scientific Research in Science and Technology
Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)
doi : https://doi.org/10.32628/IJSRST

Assessment of Total Hardness (TH) Rising Towards Danger in Ghaghara River Water at Saran District

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Article Info
Volume 9, Issue 5
Page Number : 203-206

Publication Issue
September-October-2022

Article History
Accepted : 05 Sep 2022
Published : 23 Sep 2022

ABSTRACT

Due to the presence of unwanted substances in the water of the rivers of India, its quality is getting reduced drastically. The lack of quality in the water of the river is becoming a problem for the aquatic life and human beings. Due to the increase in the total hardness of the river water, agricultural work and industries based on it are also getting affected. The increasing total hardness in the water of the Ghaghara river is affecting the current aquatic life and the work of human interest. This is the reason why we needed to study the total hardness of the Ghaghara river water.

The Ghaghara River is one of the important rivers of the country. Based on mythological texts and religious beliefs, it is considered a holy river. The Ghaghara river is known as the Sarayu river in the mythological texts of India. The Ghaghara River flows in the south direction of Chhapra town in Saran district. The water of Ghaghara river from Bhaironpur Nizamat of Doriganj to Bahuara was studied. It is between 25.7293691 North Latitude and 84.8284750 East Longitude to 25.8897213 North Latitude and 84.4919165 East Longitude. Pre-monsoon and post-monsoon water samples were studied from several major locations and their total hardness and other parameters were checked. *The total hardness of water samples found to vary in the range of 164.0 ppm to 192.0 ppm with an average of 179.11 ppm and median value of 180.0 ppm in pre-monsoon and the range of 76.0 ppm to 124.0 ppm with average value of 90.58 ppm and median of 88.0 ppm in post-monsoon.*

After examining the water sample, the data of the results obtained was studied, it was founded that the total hardness of river water was very high before monsoon but its total hardness is very less after monsoon. The average total hardness in pre-monsoon water was 179.11 ppm but its post-monsoon average total hardness only 90.5 ppm. This result proves that 86.69% increase in total hardness of water obtained by nature is due to other reasons. According to the Indian Constitution, it is the duty of all of us to protect the natural resources. It is expected from the state and central government that there is a need to manage the water of Ghaghara river through scientific methods to check the increasing total hardness.

Keywords: Total hardness, Rising, Ghaghara River, Saran District.

I. INTRODUCTION

Due to the presence of unwanted substances in the water of the rivers of India, its quality is getting reduced drastically. The lack of quality in the water of the river is becoming a problem for the aquatic life and human beings. Due to the increase in the total hardness of the river water, agricultural work and industries based on it are also getting affected. The increasing total hardness in the water of the Ghaghara River is affecting the current aquatic life and the work of human interest. This is the reason why we needed to study the total hardness of the Ghaghara river water.

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II. METHODS AND MATERIAL

Hardness in water causes scale formation in boilers. Hard water does not produce lather with soap, so it is difficult to wash clothes or do other tasks. Generally, salts of Ca (Calcium) and Mg (Magnesium) contribute hardness to natural waters.

There are two types of hardness of water:

(i) Temporary hardness (ii) Permanent hardness

Temporary hardness: The hard water in which present magnesium and calcium hydrogen carbonate is called temporary hardness. It can be removed by boiling method.

Permanent hardness: The hard water in whit present magnesium and calcium chloride or sulphate is called permanent hardness. i.e. $MgCl_2$, $MgSO_4$, $CaCl_2$, $CaSO_4$. It could not remove by boiling method.

Principle

In alkaline condition EDTA reacts with Ca (Calcium) and Mg (Magnesium) to form a soluble chelated complex. When hard water is treated with EDTA and Eriochrome Black T indicator, it changes from wine rate colour to blue, indicating the point of filtration. The pH for this titration has to be maintained at 10.0 ± 0.1. When the pH is high, calcium ions is present in it and 12 g of magnesium ions is precipitated. At this pH Murex indicator form a pink colour with Ca^{2+} When EDTA is added Ca^{2+} gets complex resulting in a change from pink to purple which indicates end point of their action.

Interference

By addition of inhibitors the lkexan can be removed in presence of metal ion.

Reagents

1. Buffer solution: Dissolve 16.9 g NH_4Cl (Ammonium chloride) in 143 NH_4OH (Ammonium hydroxide). When 1.25 g of EDTA magnesium salt is mixed and diluted to 250 ml, the indicator changes rapidly.

2. Inhibitor: Dissolve 4.5 g hydroxyl amine hydrochloride in 100 ml 95% ethyl alcohol.

3. Eriochrome Black T Indicator: Mix 0.5 dye with 100 g NaCl to prepare dry powder.

4. Standard EDTA solution 0.01 M: Dissolve 3.723 g EDTA sodium salt and dilute to 1000 ml. Standardize against standard Ca solution, 1ml = 1 mg $CaCO_3$.

5. Standard calcium solution: Weigh accurately 1.0 g AR grade $CaCO_3$ and transfer to 250 ml conical flask. Place a funnel in the neck of a flask and add 1+1 HCl till $CaCO_3$ dissolves completely. After adding 200 ml distilled water to it and heat it for about 20

to 30 minutes to expel CO_2 Cool and methyl red indicator. Ad NH_4OH 3N drop wise till intermediate orange colour develops.

Procedure

1. Keeps the sample in a 50 ml conical flask.
2. Add a pinch of Eriochrome Black T and titrate with standard EDTA (0.01 M) till wine red colour changes to blue. Record the volume of calcium and EDTA (X)
3. Run a reagent blank if buffer is not checked properly. Record the volume of calcium and EDTA (Y)
4. Calculate vol. of EDTA required by sample, C = (X-Y) from vol. of EDTA required in steps 3 & 4.
5. **Calculate as follows:**

$$\text{Total hardness mg/l as } CaCO_3 = \frac{\text{C x D3 x1000}}{ml\ in\ sample}$$

Where,

C = Vol. of EDTA required by sample.

D = mg $CaCO_3$ = per 1.0 ml EDTA 0.01 M used as titration.

III. RESULTS AND DISCUSSION

A. Statistical Data of Total Hardness Pre-Monsoon Post-Monsoon (Table 01)

Parameters.	Unit	Desirable Limit*	Mximum	Minimum	Average	Median
Pre-TH	mg/l	200	192.00	164.00	179.11	180.00
Post-TH	mg/l	200	124.00	76.00	90.58	88.00

B. Table 02: Histogram of Total Hardness (TH)

Histogram of Total Hardness (Post-monsoon)		
Range	*Frequency*	*Cumulative %*
70-80	8	18.18%
80-90	16	54.55%
90-100	16	90.91%
100-110	1	93.18%
110-120	2	97.73%
More	1	100.00%

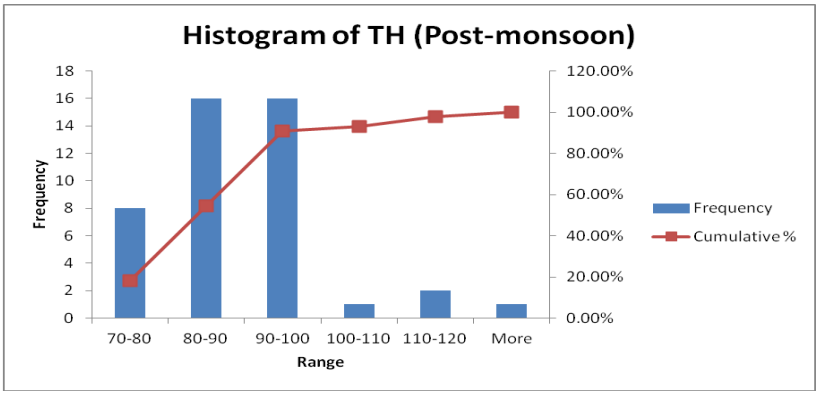

Figure 01: Bar Chart of Total Hardness (TH)

C. Data Analysis & Discussion

After examining the water sample, the data of the results obtained was studied, it was found that the total hardness of river water was very high within desirable limit before monsoon but its total hardness is very less after monsoon. The all parameters were almost within the standard limits but TDS and Iron was increased.

The total hardness of water samples found to vary in the range of 164.0 ppm to 192.0 ppm with an average of 179.11 ppm and median value of 180.0 ppm in pre-monsoon and the range of 76.0 ppm to 124.0 ppm with average value of 90.58 ppm and median of 88.0 ppm in post-monsoon. The total hardness of water in both pre-monsoon and post-monsoon is within the standard limit but its total hardness is very less after monsoon. *The average pre-monsoon total hardness in water is 179.11 ppm but its post-monsoon total hardness only 90.5 ppm. This result proves that 86.69% increase in hardness of water obtained by nature is due to other reasons.* The rising in total hardness of river water can be dangerous.

IV. CONCLUSION

After studying the data of the results obtained, it was founded that the total hardness of river water was very high before monsoon but its total hardness is very less after monsoon. The average pre-monsoon total hardness in water was 179.11 ppm but its post-monsoon total hardness only 90.5 ppm. This result proves that 86.69% increase in total hardness of water obtained by nature is due to other reasons. The rising in total hardness of Ghaghara river water can be dangerous. According to the Indian Constitution, it is the duty of all of us to protect the natural resources. It is expected from the state and central government that there is a need to manage the water of Ghaghara River through scientific methods to check the increasing total hardness.

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Cite this article as:

Sarvesh Kumar Diwakar, Prof. Udai Arvind, Dr. Subhash Prasad Singh, "Assessment of Total Hardness (TH) Rising Towards Danger in Ghaghara River Water at Saran District ", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 9 Issue 5, pp. 203-206, September-October 2022.

Journal URL : https://ijsrst.com/IJSRST229541