DETERMINATION OF IRON CONTENT IN GROUND WATER SAMPLES AT JABALPUR CITY (M.P.), INDIA

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Abstract - Ground water contamination in India is mainly an issue includes elevated levels of fluoride, arsenic, iron, and toxic metals as well as coastal salinity.

In this article, the Iron (Fe) content of groundwater in the Jabalpur District of Madhya Pradesh, India, is analyzed as a major contributor to water pollution.
10 groundwater samples around Jabalpur were collected to analyze the iron content. For the purpose of showing how iron varies throughout the year, samples were collected in two seasons: Rainy season (August) and Winter season (December).

The entire iron determination process is carried through the titration method, that requires for three chemical solutions: Mohr's salt (FeSO4(NH4)2SO4.6H2O), Sulphuric acid (H2SO4), and potassium permagnet (KMnO4).

In Jabalpur, after analyzing output it is found that, during the same winter season, the maximum value is 0.20 mg/l, while the minimum value is 0.03 mg/l during the rainy season. It has been observed that whereas the rainy season has a noticeably low iron level, the winter season has an increased Iron content.

In this work, an attempt has been made to understand whether groundwater is suitable for consumption by humans and suitability is also depending on time-to-time water monitoring and by spreading awareness about Groundwater pollution.
Keywords: Groundwater, Water Samples, Iron Content

1 INTRODUCTION

Water is a transparent fluid that comprises the majority of the fluids in living things and creates the world's rivers, lakes, oceans, and rain. A molecule of water is just a chemical composition made up of one oxygen atom, two hydrogen atoms, and a covalent bond. Although water is a liquid at normal ambient pressure and temperature, it frequently coexists with ice and steam on earth. It also occurs as clouds, mist, snow, and fog.

Water is necessary for life and the foundation of human survival and growth. Earth is nicknamed as the Blue Planet because it contains water, which makes up seven tenths of the planet's surface. Water was the first-place life began, and it makes up 96% of all living things. One of life's basic need is water. Without water, we hardly ever survive it through a few days. Fresh water resources, their conservation, and their usage are now nearly widely recognized as also being important.

Water covers 71% of the surface of the earth. All known types of life depend on it. 96.5 percentage of the water on Earth is found in seas, 1.7% is in groundwater, 1.7% is on glaciers and ice caps in Antarctica and Greenland, a small portion is in other significant bodies of water, and 0.001% is in the atmosphere as vapor, cloud cover, and precipitation. Freshwater covers up only 2.5% of the planet's total water supply, while the remaining 98.8% is found in ice and groundwater.

2 BACKGROUND OF THE STUDY

2.1 Groundwater

Water underground in saturated zones is known as groundwater. underneath the surface of the ground. Contrary to popular perception, underground "rivers" are not formed by groundwater. Sand, gravel, and other subsurface materials, as well as fractures in other underground materials, are filled. Water found in the soil, rock pores, and sand found in the cracks of rock formations is known as groundwater. Groundwater makes up around 30% of all the fresh water that is readily available globally. In the technical

sense, ground water can also include soil moisture, permafrost (frozen soil), immobile water in very low permeability bedrock, and deep geothermal or oil formation water. Typically, ground water is considered of as water flowing through shallow aquifers.

Though groundwater is usually more economical, more practical, and less vulnerable to contamination than surface water, polluted groundwater is less visible and more difficult to clean up than pollution in rivers and lakes. The most common causes of groundwater pollution is improper waste disposal on land. Industrial and household chemicals, sand garbage, landfills, excessive pesticide and fertilizer use in agriculture, industrial waste lagoons, tailing sand process waste water from mines, industrial fracking, oil field brine pits, leaking underground oil storage tank sand pipelines, sewage sludge, and sewer systems are some of the main sources.

Iron The main issues with groundwater contamination in India includes coastal salinity and elevated amounts of fluoride, arsenic, iron, and heavy metals.

The element of iron has the atomic number 26 and the sign Fe. It is a metal that is in group 8 of the periodic table and the first transition series.

The most common sources of iron and manganese in groundwater are naturally occurring, including such weathering of rocks that contain mineral sands that are rich in iron. Iron are introduced into the nearby ground water through industrial effluent, acid mine drainage, sewage, and landfills. Rural groundwater supplies frequently contain iron, which can range in concentration from 0 to 50 mg. while WHO recommended level is <0.3 mg/l.

In the aquifer, iron occurs naturally. Iron handpump and bore hole component dissolution can increase groundwater levels. Iron-bearing.

Ground water frequently leaves a noticeable stain on clothes and has a bad taste that is noticeable when preparing food and drinking.

Although having insufficient iron won't make you sick, it does contain microorganisms. Additionally, a high iron content in water results in an overload that might result in diabetes, hemochromatosis, stomach problems, and nausea. The liver, pancreas, and heart can all be damaged by it. The number of habitations, or household clusters, affected by this issue has decreased from 151,762 in 2012–2013 to 110,111 in 2015–2016, according to a Water Aid India analysis, despite iron being the largest groundwater chemical contaminants in India.

3 METHODS

3.1 General

The local population of different places of Jabalpur is aware of the poor water quality and has expressed concern about taste and aroma of the water. Both groundwater and surface water that has been contaminated with iron either becomes the water yellow when stored or already is and has a metallic taste.

To study about the Iron content in groundwater, samples were taken from near human population i.e., locations are considered for testing during rainy season (August) and winter season (December). Then analysis will be done for the sample's observation obtained from 10 different locations.

3.2 Water Sampling

Location of sampling points were selected during field visits of the site. The present study was conducted at ten sites of Jabalpur namely Madhotal, Tilwara, Ahinsa Chowk, Write Town, Kachhpura, Civil Line, Ranjhi, Hanuman Taal, Dhanwantri Nagar, Bada Fuhara which were renamed as A-1, A-2, A-3, A-4, A-5, A-6, A-7, A-8, A-9, A-10 Shown in (table 1.1). These study areas are situated in Jabalpur.

Table: 1.1 Sample Station Name and Number

Sample station name	Sample station number
Madhotal	A-1
Tilwara	A-2
Ahinsa Chowk	A-3
Write town	A-4
Kachhpura	A-5
Civil line	A-6
Ranjhi	A-7
Hanuman taal	A-8
Dhanwantri Nagar	A-9
Bada Fuhara	A-10

3.3 Observation and Calculations

3.3.1 The values of Iron in Rainy Season

SAMPLE LOCATION	IRON (mg/l)
A1	0.05
A2	0.15
A3	0.03
A4	0.09
A5	0.15
A6	0.08
A7	0.06
A8	0.12
A9	0.04
A10	0.06

3.3.2 The values of Iron in Winter Season

SAMPLE LOCATION	IRON (mg/l)
A1	0.06
A2	0.20
A3	0.09
A4	0.12
A5	0.19
A6	0.16
A7	0.07
A8	0.17
A9	0.05
A10	0.12

Wintertime is associated with a high iron concentration. Despite a slightly lower concentration during the rainy season, but some places still greater above the WHO's advised standard.

4 RESULT AND DISCUSSION

The most basic and important element affecting the water quality of groundwater is iron. The reports of observations shown in tables 2.1 (during the rainy season) and 2.2 (winter season).

In the crust of the earth, iron (Fe) is the second most common metallic element. It can be suspended or dissolved in water and can also exist in a ferrous or ferric condition. Iron exists in the ferrous state under reducing conditions, and when exposed to oxygen, the ferrous ion oxidises to the ferric state. Iron makes the water taste metallic and leaves stains on clothes, dishes, and sanitary fittings that range in colour from yellowish red to brown.

The level of iron indicates the quality of the groundwater. In the present research, the variation in groundwater's iron concentration ranged from 0.03 mg/l to 0.20 mg/l. The maximum value is 0.20 mg/l at Tilwara during the same winter season in Jabalpur, while the lowest value is 0.03 mg/l at Ahinsa Chowk during the rainy season.

5 CONCLUSION

It has been noted that the winter season has a high Iron content whereas the rainy season has a remarkably low Iron level.

Awareness among the people and society about the variation of Iron in ground water should be necessary through media or newspaper.

Water quality monitoring is required frequently at different places of ground water to take the remedial measures time.

It is needed to make an appropriate strategy to minimize and control the adverse effects of Iron present in groundwater.

There is a need to develop proper guideline based on environmental efficient techniques to achieve the aim of sustainable development of water resources in terms of quantity and quality.

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