

Chemical Assessment of Iron in the groundwater of Saharsa District, Bihar

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Manuscript received online 11 June 2025, accepted on 17 July 2025

Abstract : As the people are suffering from many types of diseases due to consumption of polluted water and hence to create awareness and to avoid these diseases, regular monitoring of water quality is essential. Present paper reports the result of chemical assessment of iron in the groundwater of Saharsa District, Bihar which is situated at latitude 25°35' – 26°28' N and longitude 86°18' – 86°51' E. All the ten community development blocks of Saharsa district have been selected as sampling sites and from each block two samples either from well or tube well, on the basis of availability of functioning well or tube-well have been collected for analysis. Thus, all together twenty samples were collected for pre- and post-monsoon seasons respectively in the year 2022. These samples were analyzed. The concentration of Iron (Fe) was found to be ranged from 0.457 ppm to 0.825 ppm for pre monsoon and 0.484 ppm to 0.848 ppm for post monsoon season. The average value was between 0.470 ppm to 0.846 ppm. As per U.S. Public Health Service (USPH) standard for drinking water the acceptable concentration of iron is 0.100 ppm and the water having 1.000 ppm iron is the cause of rejection. As per the internal standard for drinking water, prescribed by WHO, the maximum allowable limit of iron is 1.000 ppm. Though the values of iron are higher than the acceptable value of 0.100 ppm prescribed by USPH but these are within the maximum allowable limit of 1.000 ppm prescribed by WHO.

(Keywords : iron deficiency, haemoglobin, oxygen transport).

Introduction

Iron is the most essential element and its important role in the animal is the formation of

haemoglobin. Enzymes also contain iron, these include Cytochrome and Xanthine Oxidase^{1&2}. The function of iron in the body is as “Oxygen transport” and cellular respiration³. It is believed under physiological condition that inorganic forms of iron need to be reduced to the ferrous state for effective absorption^{4,5}.

The deficiency of iron in human body is characterised clinically by restlessness and fatigue, palpitation on exertion, sore tongue on occasion, angular dysphagia and Kilonychia⁶. In children, reluctance to eat (anorexia), depressed growth and decreased resistance to infection are commonly observed. In iron-deficient anaemia, abnormalities of the gastrointestinal tract, including chlorhydria and superficial gastritis have been observed⁷. The deficiency of iron in serum and plasma can get changed in various states of disease. Increased iron absorption occurs in plastic anaemia haemolytic anaemia, haemochromatosis and transfusional side effects⁸.

An unusual disorder has been reported in Asia, this has been ascribed to the consumption of drinking water with excessive iron content and resultant is an arthritic type disease. An upper desirable limit of 1ppm has been reported for drinking water⁹.

Iron occurs in the soluble form and as insoluble hydrous oxides. The ratio of Fe⁺² and Fe⁺³ in the soluble form in groundwater system

Table-1
Iron concentration in the groundwater of Saharsa District (Bihar) for pre- and post-monsoon seasons and their average in the year 2022)

Sl. No.	Sampling site	Sample No.	Fe in ppm for pre-monsoon season	Fe in ppm for post-monsoon season	Average value of Fe in ppm for pre and post-monsoon	Maximum and Minimum values in ppm
1	Nauhatta	TW1	0.825	0.812	0.818	-
2	Nauhatta	TW2	0.795	0.776	0.786	-
3	SattarKataiya	W3	0.624	0.634	0.629	-
4	SattarKataiya	TW4	0.635	0.636	0.636	-
5	Mahishi	W5	0.478	0.488	0.483	-
6	Mahishi	W6	0.457	0.484	0.470	0.470
7	Kahra	TW7	0.511	0.524	0.518	-
8	Kahra	TW8	0.514	0.532	0.523	-
9	Sour Bazar	TW9	0.688	0.652	0.670	-
10	Sour Bazar	TW10	0.615	0.644	0.630	-
11	Patarghat	TW11	0.554	0.522	0.538	-
12	Patarghat	TW12	0.529	0.530	0.530	-
13	Sonvarsa	TW13	0.695	0.688	0.692	-
14	Sonvarsa	TW14	0.682	0.668	0.675	-
15	SimriBakhtiyarpur	TW15	0.728	0.764	0.746	-
16	SimriBakhtiyarpur	TW16	0.755	0.760	0.658	-
17	Salkhua	TW17	0.685	0.632	0.658	-
18	Salkhua	TW18	0.598	0.624	0.611	-
19	BanmaItahari	TW19	0.802	0.832	0.817	-
20	BanmaItahari	TW20	0.845	0.848	0.846	0.846

is an important consideration related to its transport and toxicity. The hydrous oxides are reported as a source of particulate for co-ordination of other metals and ligands at their surface, thereby providing regular action and transport mechanisms.

Iron is probably the key element that controls phosphorous concentration in many natural waters¹⁰; yet ferric phosphate has never been isolated for sedimentary material. The chemistry of iron in the environment is as complex as it is important.

Researches across the world are continuously going on to monitor the water

quality parameters¹¹⁻⁴¹ to aware the people to use safe water for different purposes of domestic uses. Present paper describes the chemical assessment of Iron (Fe) contamination in the groundwater of Saharsa District, Bihar which is situated at latitude 25°35' – 26°28' N and longitude 86°18'–86°51' E.

Sampling Season: Samples were collected for two seasons namely pre-monsoon (May-June) and post-monsoon (October-November) seasons in the year 2022.

Sampling sites: All the ten community development blocks of Saharsa district have been selected as sampling sites and from each

block two samples either from well or tube well, on the basis of availability of functioning well or tube-well, have been collected for analysis. Thus, all together twenty samples were collected. Descriptions of these samples are given in the Table-1.

Results and Discussion

The analytical results for the concentration of iron in the groundwater of Saharsa District for pre- and post-monsoon seasons have been tabulated in the Table-1. The concentration of iron was found to be ranged

between 0.457 ppm to 0.825 ppm for pre-monsoon and 0.484 ppm to 0.848 ppm for post-monsoon season. The average value was between 0.470 ppm to 0.846 ppm. As per U.S. Public Health Service (USPH) standard for drinking water the acceptable concentration of iron is 0.100 ppm and the water having 1.000 ppm iron is the cause of rejection. As per the internal standard for drinking water prescribed by WHO, the maximum allowable limit of iron is 1.000 ppm. Though the values of iron are higher than the acceptable value of 0.100 ppm prescribed by USPH but these are within the maximum allowable limit of 1.000ppm prescribed by WHO.

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