

# The Study of Fluoride in Ground Water (Physico-Chemical Studies) of Forbesganj Block of Araria District (Bihar), India

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## ABSTRACT

*Evaluation of different physico-chemical parameters of ground water of different villages of Forbesganj Block of Araria District, Bihar. A study has been under taken for the determination of Fluoride in drinking water at Forbesganj block of Araria District (Bihar). Fluoride was measurement with the help of ion selective electrode. The Samples were collected from different sources of different locations and different villages throughout the year March 2017 to Jan. 2018.*

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## INTRODUCTION

Water extremely essential for survival of all living organisms. The quality of water vital concern for mankind since it is directly linked with human welfare. In India, most of the population is dependent on groundwater as the only source of drinking water supply. Quality water is important for human body. Water quality is influenced by various pollutants such as chemical, biological and physical elements. Excessive presence of water in bacteria, viruses, heavy metals, nitrates and salt etc. causes water pollution which adversely affects the human body. One of the biggest challenges to provide an adequate supply of safe-water

for domestic consumption to all. But, the demand for water is increasing continuously. On the other hand, the quality of water resources, which is unevenly distributed on the surface of the earth, is getting worse due to anthropogenic activities. Therefore, even countries that have huge water resources available may face water scarcity in the near future. Due to the increase in the amount of soil pollution from municipal wastes, industrial wastes and heavy use of fertilizers and chemicals in agricultural land, the properties of groundwater have also changed simultaneously. Therefore, it is necessary to analyze groundwater to study the variation in quality standards. Ground water sources such as hand pumps, wells and tube wells may contain excess fluoride where minerals like fluora-patite and croyolite are a present. About 95 present of the fluoride in the body is found in bones and teeth/Fluoride is also essential for the normal mineralization of the bones and formation of dental enamel. Fluors-par-ore (CaF<sub>2</sub>) is a major source of fluoride contamination in water and soil. Fluorspar occurs in many different rocks in varied forms. Permissible limit of fluoride concentration in drinking water as per WHO guidelines is up to 1.5mg/L. In this paper, the data pertaining to fluoride concentrations in the ground and surface water of Forbesganj Block of Araria district in Bihar state of India has been presented. For this, fieldsamples from

different sites were collected and analyzed. The results obtained are presented and discussed in this paper.

## GENERAL DESCRIPTION

**Identity:** Fluorine is a common element that is not found in primary state in nature due to its high reactivity. It is found in the earth's crust at about 0.3 g / kg and is present in many minerals as fluorides, of which fluorspar, cryolite, and fluora-patite are the most common. The oxidation state of fluoride ion is -1.

**Physicochemical Properties:** Hydrogen fluoride (HF) is a colourless, pungent liquid or gas with aboiling point of 19.5°C that is highly soluble in water, and reacts with water to form hydrofluoricacid. Sodium fluoride (NaF) is a colourless to white solid that is moderately in soluble water. Fluorosilicic acid (H<sub>2</sub>SiF<sub>6</sub>), also known as hexafluorosilicic acid, is a colorless solid that is highly soluble in water.

**Major Uses of Fluoride:** Inorganic fluorine compounds are used for many purposes in different industry. Such as Aluminum production and flow in steel and glass fiber industries. They can be released to the environment during the production of phosphate fertilizers (containing an average of 3.8%fluorine), bricks, tiles, and ceramics. Fluorosilicic acid, sodium hexafluorosilicate and sodium fluoride are used in municipal water fluoridation schemes.

## STUDY AREA

Forbesganj Block of Araria District located in the south-east of Araria district of Bihar, between the longitudes of 75°27' 35" to 76°56'48" East and latitudes of 23°45'20" to 24°52'17" North. In the present Investigation, analysis of ground water different samples of Forbesganj block in Araria district is presented. The Forbesganj block has 486,119 living in 97,524 houses, spread over a total of 2 towns, 108villages and 33 panchayats and is one of the most densely populated areas in the north-west part of Araria district. Using this as a

starting point, the researchers decided to test the quality of groundwater distributed in the Forbesganj block in Araria district. He has studied the determination of fluoride in groundwater drinking water.

## MATERIALS AND METHOD

The 218 samples of drinking water from different tube wells and wells from different location have been collected as directed by APHA. These samples were analysed at P.G. Department of Zoology lab at B.N. Mandal University, Madhepura by usual standard methods as prescribed by APHA. All chemicals used in this analysis were of A.R. grade.

## RESULTS AND DISCUSSION

The results of different samples taken from about 29 villages of Forbesganj Block (Araria) are given in table below.

**Table: Concentration of the fluoride in different samples**

S.No.	Name of the Villages	Depth (feet)	F(mg/L)
01	Simraha	34	1.41
02	Dholbazza	35	0.94
03	Bhagkohaliya	60	1.69
04	Majhwa	60	1.60
05	Amhara	60	1.68
06	Ghoraghat	65	1.95
07	Ramai	60	0.97
08	Amauna	45	1.29
09	Potari	60	1.00
10	Balidih	65	1.02
11	Dumaria	45	1.48
12	K. Bajnathpur	50	1.65
13	Pipra	70	1.62
14	Mirzapur	65	1.09

15	Pothia	70	1.67
16	Thelamohan	45	1.98
17	Lahsunganj	45	1.29
18	Bheriyari	55	1.20
19	Bokra	60	1.16
20	Sirsia	55	1.70
21	Jhiruwa	40	0.56
22	Parwaha	42	0.27
23	Matiyari	70	1.60
24	Bhattawari	75	1.40
25	Rampur	60	1.69
26	Bhadreshwar	65	1.72

From the above table, fluoride (F<sup>-</sup>) ion varied from 0.28 mg/L to 1.98 mg/L. Minimum 0.28 mg/L and Maximum 1.98 mg/L concentration of F<sup>-</sup> were observed from Parwaha and Thelamohan villages respectively. Above table also clear that 12 samples out of 26 contain fluoride above the permissible limits of WHO i.e. 1.5 mg/L. In Forbesganj block 46.15 percent water samples have higher than 1.50 mg/L.

## CONCLUSION

This study shows that the fluoride concentrations of about 46% villages groundwater samples analyzed are higher than 1.5 mg/L and up to 3.02 mg/L, which is much higher than the permissible limits prescribed by WHO. Due to high fluoride contents in potable water of investigated area, a large number of people are having known symptoms of dental fluorosis. Water in these villages of the study area is not suitable for domestic consumption without pre-treatment. Therefore, a groundwater management programme has been suggested.

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