

Estimation Of Arsenic Concentration In Ground Water

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ABSTRACT: Ground water samples from two different villages i.e. Amgaon and Bandha Bazar of Rajnandgaon district of Chhattisgarh were collected and analyzed for its quality and especially for concentration of Arsenic. In this process it's been observed that Arsenic concentration was very higher in levels than the drinking water standard of IS:10500;2012. This may be due to presence of sedimentary deposits from volcanic rocks. So the mineral leaching may appear in the ground water which leads to Arsenic contamination. It shows very drastic effect in the human health.

INDEX TERMS: Ground water¹, Arsenic², Chhattisgarh³, villages⁴, human health⁵.

1. INTRODUCTION

The concentration of Arsenic is higher in most of the countries. This could be a result of human action, like metal mining or the utilization of pesticides. Natural conditions can also lead to a higher concentration. can be found combined with alternative parts in numerous chemical compounds[3]. Arsenic can be introduced in to aquatic systems through effluent discharges from various sources and runoff water. Contamination of freshwater ecosystem with heavy metals like Arsenic is a major environmental problem all over the world due to their pervasiveness and persistence. Arsenic, in very low concentration has its adverse effect on health. In India, 0.01 ppm (or 10µg/l) concentration of arsenic has been considered the upper safe limit in drinking water. Inorganic arsenic compounds are more harmful than organic ones[2]. They are more likely to react with the cells in the body, displace certain elements from the cell, and change the cell's function. The symptoms of arsenic poisoning are often acute, or severe and immediate, or chronic, where damage to health is experienced over a longer period. This will usually depend upon the strategy of exposure. A person UN agency has engulfed arsenic might show signs and symptoms inside half-hour. These may include drowsiness, headaches, confusion, severe diarrhea[4].

If arsenic has been inhaled, or a less concentrated amount has been ingested, As the arsenic poisoning symptoms are, the patient may start experiencing convulsions, and pigmentation of their fingernail may change. Signs and symptoms associated with more severe cases of arsenic poisoning are metallic taste in the mouth and garlicky breath, excess saliva, problems swallowing, blood in the urine, cramping muscles, hair loss, stomach cramps, convulsions, excessive sweating, vomiting, diarrhea, Arsenic poisoning typically affects the skin, liver, lungs, and kidneys. In the end, symptoms embody seizures and shock[5]. This could lead to a coma or death. Complications linked to long-term arsenic

consumption include cancer, liver disease, diabetes, nervous system complications, such as loss of sensation in the limbs and hearing problems, digestive difficulties

2. STUDY AREA & OBJECTIVE

2.1. Study Area

Chhattisgarh is a state in Central India. It is the 10th largest state in India with geographical area of 137, 90 thousand ha. Chhattisgarh stretches across the latitudinal expanse of 17°46' to 23°15' North on one hand to the longitudinal meridian of 80°30' to 84°23' East on the other. Study area Amgaon & Bandha Bazar villages lies at 21.5398°N, 81.0175°E & 20.8373° N, 80.7450° E of Rajnandgaon district in Chhattisgarh.

2.2. Objective

In many studies Arsenic has been identified in high concentrations in Ambaghar chowki block, Hence In this study we have selected a village Amgaon and Bandha Bazar, Rajnandgaon district of Chhattisgarh state (which is adjacent to ambaghar chowki) to check whether the Arsenic is leaching to the ground water of the near by villages or not. For this we have collected water samples from Bore wells of said villages and analyzed for Arsenic contamination using sophisticated instrument called ICPOES with standard methods[5]. The concentration of Arsenic present in the collected water is compared with drinking water standard IS:10500[3] and reported the same.

3. METHODOLOGY

3.1 Sample Collection

The samples were collected in plastic bottles which were cleaned with detergent, rinsed with demineralised water, then kept in 5 % nitric acid for a day and finally rinsed once again with demineralised water[5]. After sample collection, samples were properly packed in a ice-box and sent to the laboratory[6]. To determine total Arsenic concentration samples were acidified with nitric acid (suprapur nitric acid of 65 % (v/v))[4].

3.2. Analysis

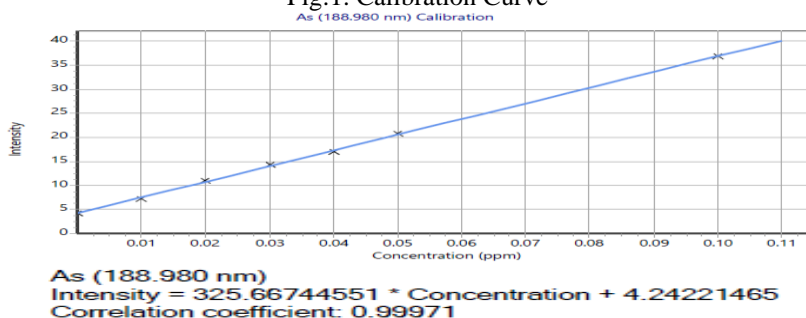
Arsenic was analyzed by direct aspiration of ground water samples into Inductively Coupled Plasma – Optical Emission Spectrometer (ICP-OES) (Agilent) system and quantified against by Certified Reference Material (Multi elements Merck). Six different linear concentration standards were prepared, ranging from 0.01mg/L to 0.1

mg/L.[7] and aspirated into ICP-OES system before conducting sample analysis, and linear curve was prepared[7]. good linear graph is observed in the preparation of standard curves. After the completion of standard curve preparation, one standard check is analyzed[6]. And Calibration curve[3] details are as below.

Table :1. Details of Calibration standard

S.No.	Solution Label	As(188.980) Concentration
1	Blank	0.00
2	Standard-1	0.01
3	Standard-2	0.02
4	Standard-3	0.03
5	Standard-4	0.04
6	Standard-5	0.05
7	Standard-6	0.10

Fig:1. Calibration Curve



4. RESULTS AND DISCUSSION :

ICP-OES is based on emission technique. By using ICP-OES technique we can determine minimum 10 ppb levels[5].

Observed Arsenic Concentrations are given in below table.

Table :2. Details of Concentration of Arsenic in sample

Sample .No.	Name of the Village	Concentration of Arsenic(As) mg/L	Acceptable limit of As in Drinking water as per IS:10500 ;2012 (mg/l)
1	Amgaon	0.059	0.01
2	Bandha Bazar	0.085	0.01

During the study period December 2018, Arsenic concentration levels in ground water of selected villages are 0.059 mg/L and 0.085 mg/L.The maximum acceptable limit for arsenic as per IS: 10500[3] and World Health Organization is 0.01mg/L[6]. The observed concentration levels of Arsenic in above villages are beyond the permissible limits of IS: 10500[3] and WHO guidelines.

5. CONCLUSION:

Arsenic is the most considerable contaminants in ground water. Excess levels of Arsenic might cause several short term and long term health effects to the human being. ICP-OES is one of the most widely and universally using technique for determination of arsenic up to trace levels[5]. The present study is focussed on determination of Arsenic (As) in Amgaon and Bandha Bazar villages of Rajnandgaon district chhattisgarh state by using Inductively Coupled Plasma – Optical Emission Spectrometer (ICP-OES) technique[7]. The Results are reported and compared with drinking water quality standards given by the Indian

Standards (IS : 10500) and World Health Organization (WHO), 4th edition in 2011. In the study It is observed that concentration level of Arsenic in both the villages are observed higher side than acceptable limits of IS : 10500[3].

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