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Prevalance and Distribution of Arsenic in Groundwater in Rural Parts of Raichur District, Karnataka, India

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***Abstract*: The present study investigates the ground water quality database of rural area, Raichur District, Karnataka with special reference to arsenic. According to WHO (2012) range excel 0.01 mg/L of arsenic in drinking water is considered to be unfit for potable and hazard to human health. This paper provides a comprehensive review on the data on arsenic concentration. Aiming at improving the quality of groundwater and removal of Arsenic using technological methods which are user friendly and cost effectively.**

***Keywords*: Groundwater, Arsenic, Raichur, Drinking water**

1. Introduction

Water that seeps through the soil and underground rocks is referred to as groundwater. The chemistry of the groundwater is influenced by the composition of the aquifer, by the chemical and biological processes that occur as water infiltrates through the aquifer. Due to urbanization which leads to depleting of surface water, hence, most of the people are mainly depending upon groundwater resources for industrial, domestic, drinking and agricultural purposes. Many researchers have focused on hydro chemical characteristics and contamination of groundwater in different basins as well as in urban areas that resulted due to anthropogenic intervention mainly by agricultural activities and industrial and domestic wastewater (Raju, 2007; Singh et. al., 2008).

Arsenic distributed widely in the earth's crust and it comes under metalloids. Arsenic, from both natural and anthropogenic sources, is mainly transported in the environment by water. Arsenic affects human health via drinking water and it is considered as one of the significant cancer causing agent in the world (Smith, 1992). Therefore, it is necessary to document the levels of arsenic in drinking water and its chemical speciation and for establishing regulatory standards and guidelines (Welch, 2000). Exposure to high inorganic arsenic levels from long-term which results conjunctivitis, peripheral neuropathy, enlarged liver, high blood pressure, renal system effects and cardiovascular disease.

WHO provides the provisional guideline limit value for arsenic in drinking water. A statutory limit 10 µg/L (WHO 2012) has been applied by developing countries to use the given value as a national standard because of arsenic analytical difficulties and its compliance. The present study has been undertaken to know the concentration level of arsenic compounds in groundwater.

2. Materials and Methods

A. Study Area

Raichur district is situated in Karnataka state. Raichur district represents the area of Tungabhadra basin. The elevation varies generally between 450 and 700 metres.

Fig. 1. Map showing the study area (Raichur District of Karnataka State)

Present work concentrates on the study of Arsenic analysis and the ground water samples were tested with ICQPMS (Inductively coupled plasma quadrupole mass spectrometry) method at Laboratory. In all, 48 tube well samples were

collected from various sites of study area and the results obtained have been compared with WHO (2012) standards. Water samples were collected at season-wise in polythene cans from Tube wells. The values of arsenic in groundwater is expressed in mg/l.

3. Results and Discussions

The seasonal variations in concentration of Arsenic concentration and its abundance in the study area for a period of one year (2014) and readings has been presented in tabular form and also represented using appropriate graph and pie chart.

This study reveals data on arsenic in groundwater used for drinking purpose from 48 villages of Raichur District. In the present investigation, the total arsenic concentration in groundwater samples, varied from three seasons i.e., pre-monsoon, post monsoon for the year 2014.

Table 1
Arsenic concentration of groundwater samples of Lingasugur taluk during pre-monsoon season, 2014

Sl. No.	Sample No.	Arsenic (As)	Sl. No.	Sample No.	Arsenic (As)
1	B_1	0.02	25	B_{25}	0.01
2	B_2	0.05	26	B_{26}	0.03
3	B_3	0.015	27	B_{27}	0.04
4	B_4	0.02	28	B_{28}	0.03
5	B_5	0.15	29	B_{29}	0.03
6	B_6	0.1	30	B_{30}	0.02
7	B_7	0.56	31	B_{31}	0.05
8	B_8	0.35	32	B_{32}	0.03
9	B_9	0.002	33	B_{33}	0.04
10	B_{10}	0.01	34	B_{34}	0.03
11	B_{11}	0.006	35	B_{35}	0.08
12	B_{12}	0.05	36	B_{36}	0.02
13	B_{13}	0.04	37	B_{37}	0.04
14	B_{14}	0.01	38	B_{38}	0.06
15	B_{15}	0.009	39	B_{39}	0.35
16	B_{16}	0.03	40	B_{40}	0.45
17	B_{17}	0.02	41	B_{41}	0.02
18	B_{18}	0.01	42	B_{42}	0.01
19	B_{19}	0.03	43	B_{43}	0.234
20	B_{20}	0.004	44	B_{44}	0.07
21	B_{21}	0.01	45	B_{45}	0.3
22	B_{22}	0.03	46	B_{46}	0.03
23	B_{23}	0.04	47	B_{47}	0.04
24	B_{24}	0.02	48	B_{48}	0.6

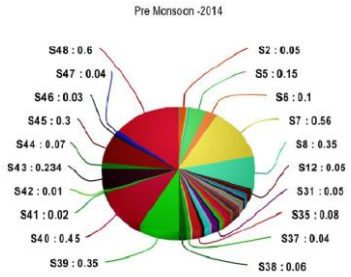

Fig. 2. Density of Arsenic contamination in Groundwater Samples at Pre monsoon season 2014

Table 2
Arsenic concentration of groundwater samples of Lingasugur taluk during post- monsoon season, 2014

Sl. No.	Sample No.	Arsenic (As)	Sl. No.	Sample No.	Arsenic (As)
1	B_1	0.03	25	B_{25}	0.02
2	B_2	0.09	26	B_{26}	0.042
3	B_3	0.05	27	B_{27}	0.05
4	B_4	0.03	28	B_{28}	0.04
5	B_5	0.03	29	B_{29}	0.036
6	B_6	0.14	30	B_{30}	0.03
7	B_7	0.6	31	B_{31}	0.055
8	B_8	0.45	32	B_{32}	0.037
9	B_9	0.006	33	B_{33}	0.048
10	B_{10}	0.02	34	B_{34}	0.038
11	B_{11}	0.02	35	B_{35}	0.084
12	B_{12}	0.01	36	B_{36}	0.026
13	B_{13}	0.05	37	B_{37}	0.041
14	B_{14}	0.02	38	B_{38}	0.062
15	B_{15}	0.012	39	B_{39}	0.4
16	B_{16}	0.04	40	B_{40}	0.45
17	B_{17}	0.03	41	B_{41}	0.025
18	B_{18}	0.03	42	B_{42}	0.015
19	B_{19}	0.032	43	B_{43}	0.29
20	B_{20}	0.006	44	B_{44}	0.076
21	B_{21}	0.02	45	B_{45}	0.32
22	B_{22}	0.04	46	B_{46}	0.032
23	B_{23}	0.06	47	B_{47}	0.043
24	B_{24}	0.05	48	B_{48}	0.62

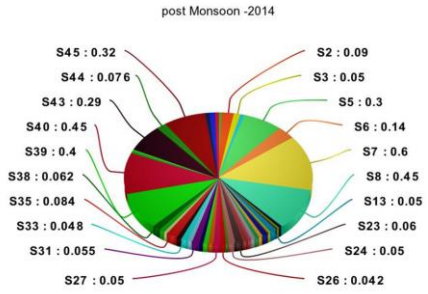

Fig. 3. Density of Arsenic contamination in mg/L Groundwater Samples at Post Monsoon season 2014

4. Conclusion

From the present study it can be concluded that due to overexploitation of the groundwater over the years for domestic purpose, the quality of the groundwater has been degraded which results the dissolution of rocks and ions leads to increase in the Arsenic concentration. This study infers immediate attention towards the improvement of water quality. Suitable measures have to be taken. In order to improve the quality of groundwater through artificial recharge and immediate attention to be given by the concerned.

Arsenic being a toxic element exceeds in its concentration in all the 48 groundwater samples. Most of all groundwater samples the concentration of arsenic exceeds the permissible limit The limit prescribed by the WHO standards (0.01 mg/L). Therefore, it needs immediate attention to monitor meticulously before the water is used for drinking purpose by the people living in that area.

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