

Study of Water Quality Parameters of Ground Water in Sirohi District (Rajasthan)

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Abstract

Water is the essential natural resource for life. Ground water plays a major role in satisfying the need of life. Sirohi district where marble and cement industries are dominating industry, there is a need of the study of Physico-chemical parameters of various ground water bodies belonging to this district as ground water is the major source of supplying drinking water by the municipality. The present study will help in improving drinking water quality. Water quality parameters of ground water of Sirohi district has been investigated in two seasons of the year. Fluoride, Chloride, TDS, Nitrate, pH, Hardness and Alkalinity parameters of ten villages in monsoon and summer seasons were recorded and compared. Parameters were studied following Titrimetric, Titration and Colorimetric methods. Villages having high level of fluoride, TDS, Hardness etc have been identified and values compared with the standard values, prescribed by NEERI, WHO and APHA. Fluoride is the key aspect of water quality in water supply system. A big change in all water quality parameters was observed before and after the monsoon seasons.

Keywords: Titrimetric, Titration, Colorimetric

Introduction

Water is the essential natural resource for life. Ground water plays a major role in satisfying the need of life. With the urbanization, industrialization and increasing population, the demand of water resources is increasing. The unfortunate part is that whatever resources are available and being polluted by human activities. This is exerting crisis of this valuable resource. The present need is to manage the avoidable water resources. Sirohi is the district where marble and cement industry are the dominating industries. So there is an urgent need of the study of Physico-chemical parameters of various ground water bodies belonging to this district as the ground water is the major source of supplying drinking water by the municipality. The present study will help in improving the drinking water quality.

A total of ten samples of 500 ml water were collected from ten different villages of Sirohi district in clean PET bottles after rinsing with same water. The sampling points were hand pumps, open wells and tube wells. All the parameters of ground water of all the ten villages have been recorded in all the two seasons of a year and season wise comparison of values of all villages was carried out. Villages having high level of fluoride, TDS, Hardness etc were identified and compared with the standard values prescribed by NEERI, WHO and APHA. Fluoride is the key aspect of water

quality in water supply system. Fluoride has shown to cause a significant effect on human health.

Study Area

Rajasthan is situated at the west side of India and has kite shape. Sirohi district is situated at the south west part of Rajasthan between parallel of $24^{\circ} 20'$ and $25^{\circ} 17'$ north latitude and $72^{\circ} 16'$ and $73^{\circ} 10'$ east latitude. It has an area of 5136 sq.km. It is the third smallest district of Rajasthan after Dungarpur and Banswara. It is bounded by district Pali, Udaipur, Jalore and Banaskantha district of Gujarat state. The average rain fall of the district is 665mm. Sirohi district has five tehsils Sirohi, Sheoganj, Pindwara, Aburoad and Reodar. Ten villages of all the five tehsils have been studied.

Materials, Methods and Instrumentation

Most of the methods were used as prescribed by APHA. Fluoride was determined by Scott-Sanchis (visual) method and APHA method. Residual Chlorine was removed by Sodium Arsenite solution. Colour preparation was done in nessler's cylinders. In SPADNS method, microprocessor based Spectrophotometer (model 1305) was used at 570 nm. For the detection of nitrate, phenol disulphonic acid method 4 was used in which nitrate was detected at 410 nm. TDS was

determined by apparatus model Combo by Hanna

model HI98129.

Table-1 Physico-Chemical Analysis of ground water during Rainy season

Sr.No.	Name of Village	Flouride (mg/l)	Chloride (mg/l)	TDS (mg/l)	NO ₃ (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	pH
1	Chandrawati	5.8	1007	3289	13	678	341	7.4
2	Rohida	4.9	1200	2300	17	267	187	6.4
3	Bageri	4.5	789	1200	16	357	300	6.8
4	Aval	2.2	876	1340	18	780	420	7.2
5	Ker	3.4	676	780	11	320	320	7.8
6	Esera	5.3	787	1345	13	479	185	6.6
7	Nandia	1.2	456	1156	15	134	197	6.9
8	Pandui	3.2	900	1167	13	189	234	5.8
9	Kesharpura	1.7	897	989	18	287	338	5.9
10	Bhave	2.7	1200	2380	19	367	412	6.8

Table -2 Physico-Chemical Analysis of ground water during Summer Season

Sr.No.	Name of Village	Flouride (mg/l)	Chloride (mg/l)	TDS (mg/l)	NO ₃ (mg/l)	Hardness (mg/l)	Alkalinity (mg/l)	pH
1	Chandrawati	7.3	1180	3528	26	840	480	7.2
2	Rohida	5.3	787	1345	13	479	185	6.6
3	Bageri	1.2	456	1156	15	134	197	6.9
4	Aval	3.2	900	1167	13	189	234	5.8
5	Ker	1.7	897	989	18	287	338	5.9
6	Esera	2.7	1200	2380	19	367	412	6.8
7	Nandia	5.8	1007	3289	13	678	341	7.4
8	Pandui	4.9	1200	2300	17	267	187	6.3
9	Kesharpura	4.5	789	1200	16	357	300	6.8
10	Bhave	2.2	876	1340	18	780	420	7.2

Results and Discussion

The seasonal variations of physico-chemical characteristics of the water samples of different villages are given in tables 1 and 2 for summer and monsoon seasons respectively. Climatic factors such as rainfall, temperature, pressure and humidity etc. plays an important role in the geology as well as terrestrial environment. A good knowledge of these factors help in understanding the complex process of interaction between the climate and biological process. In the present study, the values of pH were in the range of 6.4 to 7.8. The least value was recorded to be 6.3 pH in the month of

summer season from village Pandui while maximum was recorded to be 7.8 pH in rainy season from Kher village. Chemical parameter like pH is considered as an indicator of overall productivity that causes habitat diversity. The pH was found to be alkaline as well as acidic in nature at most of the sites. The pH was observed to decline in summer and increase in rainy season as is evident from the mean value. The lower values of pH during rainy season as compared to summer season might be due to the dilution of alkaline substances. Total dissolved solid (TDS) is the term used to describe the inorganic salts and small amount of organic matter present in the solution of water. TDS value was in the range of 780 to 3289

mg/l in rainy season and 989 to 3528 mg/l in summer.

Hardness is the indicator of hydro- geological aesthetic quality. The hardness ranged from 134mg/l to 840mg/l (minimum in summer). These findings suggest that the underground water is moderately hard and high medium productive.

Fluoride concentration was found to be minimum in rainy season (1.2 mg/l) and maximum in summer (7.3 mg/l). High concentration of fluoride causes dental fluorosis while low concentration causes dental caries. Chloride is the indicator of contamination with animal and human waste. Chloride is a common constituent of all natural water and is generally not classified as harmful constituent. There are both minimum and maximum values of fluoride needed in drinking water. If there is not enough content in the water, then this may result in tooth decay and dental caries. High concentration of fluoride in the water may result in dental and skeletal Fluorosis. The severity depends upon the amount ingested and the duration of intake. Dental Fluorosis is a condition where excessive fluorides can cause yellowing of teeth, white spots and pitting or mottling of enamel. Consequently, the teeth become unsightly. Dental Fluorosis occurs more frequently in children under the age of 6 due to the fact that the enamel formation has not yet developed. Dental Fluorosis occurs more often where teeth are forming under the gums. Skeletal Fluorosis is a bone disease

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exclusively caused by excessive consumption of fluoride which depending upon the degree of Fluorosis can cause increase in bone mass, stiffness in joints and osteoporosis. This is more frequent in later stages in life with ingestion of high level of fluoride. Fluoride concentration between 0.9-1.2 mg/litre may give rise to mild dental Fluorosis. Value of 1.5-2.0 mg/lit. Fluoride in drinking water gives rise to higher chances of Dental Fluorosis while values exceeding 2 mg/lit. Total intake of fluoride above 6 mg per day has shown to increase the effects on the skeleton, while fluoride intake above 14 mg per day pose serious threats of severe skeletal effects.

Fluoride can have serious effects on skeleton tissues as well, with adverse changes in bone structure. Drinking water containing 3-6 mg/lit of fluoride has shown to cause such deficiencies.

Conclusion

Analysis of Sirohi district underground water resources in both seasons summer and rains during 2017 shows that the ground water of villages Rohida and Bhawe are suitable for drinking in both the seasons while underground drinking water of rest of the villages is not suitable for both seasons. The effective maintenance of water quality of local resources through appropriate control measure and continuous monitoring of their quality parameters is suggested.