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Some Physico-Chemical Parameters of Ground Water Samples of Jetaran Area, Pali District, Rajasthan (India)

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Abstract

Ground water is one of the most useful water sources. It has become scarce due to frequent drought situations and increased human activity leading to water pollution. The use of fertilizers, pesticides and insecticides in rural areas and lime, bleaching powder, refuse dumps etc. in urban areas are the main source of soil and underground water pollution.

In the present study, we have collected groundwater samples from different place of Jetaran. These samples have been analysed on the basis of various qualitative parameters namely, temperature, P^H, total alkalinity, total hardness, total dissolving solid, dissolved oxygen, turbidity, sulphate, nitrate, chloride, fluoride. This study was aimed to assess the suitability of the ground water for the drinking and domestic purposes.

Keywords: Physicochemical Properties, Groundwater Quality, Total Dissolved Solids, Nitrate, Fluoride.

Introduction

Water is a wonder of the nature. “No life without water’’ is a common saying depending upon the fact that water is the one of the naturally occurring essential requirement of all life supporting activities. It is a dynamic system, containing living as well as non-living, organic, inorganic, soluble as well as insoluble substances. So its quality is likely to change day by day and from source to source. Any change in the natural quality may disturb the equilibrium system and would become unfit for designated uses. The availability of water through surface and groundwater resources has become critical day to day[1-3].

Our Present Study area Jetaran is located in Pali district Rajasthan state in India. This area is a part of Marwar region. The ground water is generally used for drinking, domestic and agricultural purposes in this area. Ground water crisis is not the result of natural factors. It has been caused by human actions[4]. The use of fertilizers and pesticides, manure, lime, bleaching powder, septic tank, and industrial effluents, domestic and agricultural wastes etc. is the main sources of ground water pollution[5].

Fluorosis due to drinking water has been reported in thousands of villages in Andra Pradesh, Western M.P., Rajasthan, Uttar Pradesh and Gujarat. Fluorosisis effect on dental and skeleton tissues of animals and human beings. Itis characterised by back pain in lumber and cervical region, rigidity and stiffeners of spine and chest limitation of movement of joints with the ankylosisof spine, hips and knees, crotalaria genugenu valgum and wind swept deformities of leg, inability to walk and crippling[6].It is evident that many parts of the industrial area in India are colonized in very close vicinity of the industries and using groundwater for drinking, cleaning and bathing purposes[7].

Aim of the Study

Present study deals with the suitability of ground water for human uses and aware to people about side effects of polluted water on animals and human beings.

Experimental

Sample Collection Area

The ground water samples were collected from ten different areas located around Jetaranregion pali district during March to June 2014.

Sample Collection

The ground water samples were collected in brown glass bottles with necessary precautions[8] from tube well sand deep hand pumps located around Jetaranregion. Nearly two litre of each water sample was collected early in morning. The bottles were thoroughly cleaned with Hydrochloric acid and then washed with tape water rendered free of acid and then

washed with distilled water twice and again rinsed with the water sample to be collected and then filled up the bottle with the sample leaving only a small air gap at the top, stopper and sealed the bottle with paraffin wax. Some samples which were turbid or containing suspended matter were filtered at the time of collection. All the glassware, casserole and other pipettes were first cleaned with tape water thoroughly and finally with de-ionized distilled water. The pipettes and burette were rinsed with solution before final use. It was ensured that the concentrations of various water quality parameters do not changes in time that elapses between drawing of samples and the analysis in the laboratory. Samples were analysed immediately for parameters, which need to be determined instantly and rest of samples were refrigerated at to be analysed later. The results of samples vary with different collecting places because of the different nature of soil contamination[9].

Method of Physico-Chemical Analysis

1. The collected samples were analysed for physic-chemical parameters. Temperature and P^H were measured at the time of sampling itself.
2. Total hardness of water was measured by complexometric titration methods[9].
3. Chloride contents were measured by silver nitrate titrimetric method using potassium chromate indicator.
4. Sulphate contents were measured by volumetric method[9].
5. Total alkalinity was determined by visual titration method using methyl orange and phenolphthalein as indicator.
6. The Winkler test is used to determine the concentration of dissolved oxygen samples. Dissolved oxygen (DO) is widely used in water quality studies and routine operation of water reclamation facilities.
7. Total dissolve solid (TDS) was determined by evaporation method in an oven maintained at 200^oC for 2hrs.
8. Fluoride values were measured by spectro photo meter method and nitrate determined by Brucine method.

Result and Discussion

Table-1: Reading of Ground Water Samples Collected from Jetaran Area

S. No.	Parameter	Sample Point										
		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11
1	Temperature(^{0}C)	12.5	13.5	15.0	14.5	18.5	17.6	15.5	19.5	16.5	17.5	15.3
2	P^H	7.44	6.95	7.86	8.10	6.70	7.91	7.62	8.35	8.25	7.95	7.5
3	Total hardness(mg/l)	285	665	450	700	850	310	400	1050	950	1230	750
4	TDS (mg/l)	450	960	850	1210	1460	500	765	2010	2530	2915	2320
5	DO (ppm)	5.2	5.10	2.58	2.95	2.55	2.65	2.10	2.05	4.60	3.20	5.0
6	Chloride (mg/l)	250	255	300	245	350	250	310	355	600	850	750
7	Sulphate (mg/l)	160	115	250	350	400	250	325	350	150	145	260
8	Nitrate (mg/l)	50	45	30	40	42	44	45	50	45	35	40
9	Total Alkalinity(mg/l)	200	205	240	260	300	310	265	295	350	320	410
10	Fluoride (mg/l)	1.00	4.5	3.55	1.5	9.5	6.5	2.5	7.0	6.5	8.5	4.2

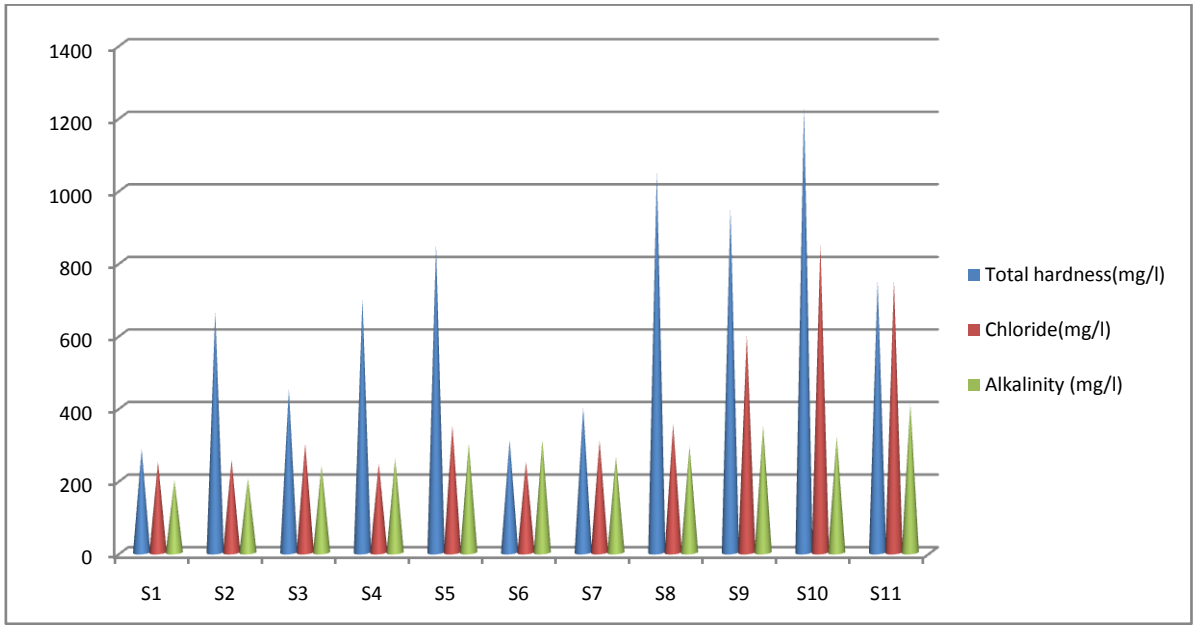

Figure -1 Chemical Parameters of Ground Water

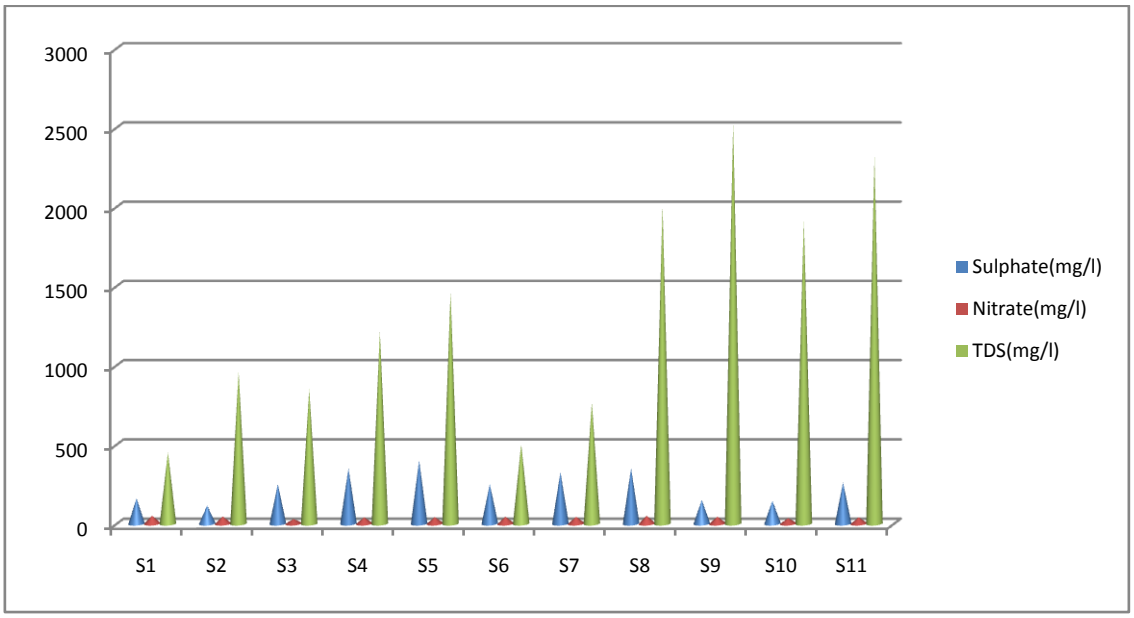

Figure -2 Chemical Parameters of Ground Water

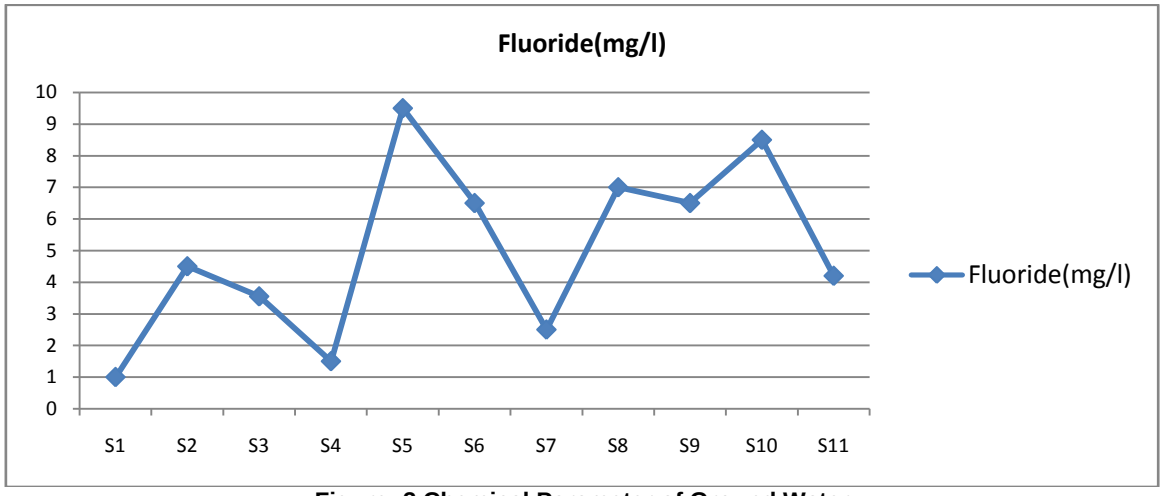

Figure -3 Chemical Parameter of Ground Water

Temperature

Temperature is an important biologically significant factor, which plays an important role in the metabolic activities of the organism. In present study temperature ranged from 12.5°C to 19.5°C. Lowest water temperature was observed in the siteS1 was 12.5°C.The temperature of water generally depends on the atmospheric condition.

P^H

p^H is a measure of the hydrogen ion concentration in water and indicates whether the water is acidic or alkaline. The measurement of alkalinity and acidity of pH is required to determine the corrosiveness of the water. The limit of P^H value for drinking water is specified as 6.5 to 8.5 by WHO. In different samples P^H ranged from 6.70 to 8.35. In the present study the P^H shows with in range.

Total Hardness

Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water[10]. In present study total hardness of water varied from 285 to 1230 mg/l in all ground water samples. The total hardness values in maximum sample are exceeded than permissible limit. Water hardness is generally because of the geochemical formulations of water[11] and due to presence of various salts of calcium and magnesium (bicarbonates, carbonates, sulphates, chlorides etc.). Inadequate intakes of calcium have been associated with increased risks of osteoporosis, nephrolithiasis (kidney stones), colorectal cancer, hypertension and stroke, coronary artery disease, insulin resistance and obesity. Increased intake of magnesium salts may cause a temporary adaptable change in bowel habits (diarrhoea) and is the cause of hyper magnesia in which human and animals are unable to excrete magnesium from body[12]. Temporary hardness of water can be reduced by boiling and permanent hardness can be treated by various methods[13].

Total Dissolved Solid

Hardness although have no health effects it can make water unsuitable for domestic and industrial use. TDS of all ground water samples ranged 450 to 2915. Some samples contain TDS out of maximum permissible limit suggested by WHO & Indian standards[14].

Dissolved Oxygen

Dissolved oxygen is oxygen that is dissolved in water. Its levels fluctuate seasonally and over a 24-hour period. They vary with water temperature and altitude. Cold water holds more oxygen than warm water and water hold less oxygen at higher altitudes.In present study dissolved oxygen ranged from 2.10 to 5.95 ppm.

Chloride

Chloride a major anion in potable and industrial water has no adverse effect on health, but imparts bad taste to drinking water. The chloride concentration serves as an indicator of pollution by sewage. People accustomed to higher chloride in water are subjected to laxative effects[15]. The Chloride content in samples is in between 250 to 850 mg/L.

Sulphate

Sulphate is found in small quantities in ground water. Sulphate may come into ground water by industrial or anthropogenic additions in the form of Sulphate fertilizers. The sulphate was found in ranged from 115 to 400 mg/L. This is in prescribed limit[16].

Total Alkalinity

Alkalinity in streams is influenced by rocks and soils, salts, certain plant activities, and certain industrial wastewater discharges. Measuring alkalinity is important in determining a stream's ability to neutralize acidic pollution from rainfall or wastewater. It's one of the best measures of the sensitivity of the stream to acid inputs. Alkaline compounds in the water such as bicarbonates (baking soda is one type), carbonates and hydroxides remove H^+ ions and lower the acidity of the water (which means increased PH). They usually do this by combining with the H^+ ions to make new compounds. Without this acid-neutralizing capacity, any acid added to a stream would cause an immediate change in the P^H. The total alkalinity ranged from 200 to 410 mg/L. Alkalinity can be removed by reverse osmosis, along with other total dissolved solids.

Nitrate

The high nitrogen content is an indicator of organic pollution. It results from the added nitrogenous fertilizers, decay of dead plants and animals, animal urines faces, etc. Nitrate in high concentration has been observed in ground water of Churu of Rajasthan[17]. Moreover, the increased nitrate level in drinking water may adversely affect the central nervous system[18]. Nitrate ranged in all samples was from 30 to 50 mg/L. This is in the prescribed values[19].

Fluoride

Probable source of high fluoride in Indian waters seems to be that during weathering and circulation of water in rocks and soils, fluorine is leached out and dissolved in ground water[20]. Maximum permissible limit is 1.0 ppm (WHO)[21]. Small concentration of fluoride in drinking water has beneficial effect on human body but higher concentration beyond 1.5 ppm caused dental and skeletal fluorosis. In the present analysis, fluoride concentration was found in all samples sites. It is found 1.0 mg/l to 9.5 mg/l throughout the sites.

Conclusion

The ground water of the studies area Jetaran has been found to be unfit for drinking because in maximum samples fluoride has been detected in high value than maximum permissible limit. Excess fluoride may lead to tooth decay and kidney disease. These sample water are not suitable for drinking. It is suggested that the people in this area should drink only treated water. Minor filtration, reverse osmosis and deionization methods are suggested for further purification of water.

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