International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 5 Issue 5, July-August 2021 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Physicochemical and Biological Parameters of Groundwater of 10 Blocks of Ajmer District, Rajasthan, India

Kishan Gopal Jhanwar, Rajeev Mehta, Preeti Mehta

Department of Chemistry, Sangam University, Bhilwara, Rajasthan, India

ABSTRACT

This paper corresponds to detection of physicochemical parameters of 1 groundwater of 10 blocks of Ajmer District, Rajasthan. These 10 blocks are Ajmer, Kishangarh, Peesangan, Nasirabad, Beawar, Masuda, Sarwar, Bhinay, Kekri and Arain. Ajmer is a district in the Rajasthan State of India. Total area of Ajmer is 8,481 km² including 8,091.33 km² rural area and 389.67 km² urban area. Ajmer has a population of 25,83,052 peoples. There are 4,94,832 houses in the district.

The Ajmer district is further divided in to Tehsils / Blocks / Community Development Blocks (C.D.Blocks) for administrative purposes. In India, the Block or C.D.Block is often the next level of administrative division after the tehsil. It is important to note that, In some states of India C.D.Blocks are equal to tehsils.

Water samples from 10 blocks given above were collected during Pre-Monsoon (April-June) and season of the year 2021. The data were analyzed for mainly Electrical Conductivity (EC), Total Dissolve Solids (TDS), Chloride (Cl-), Fluoride (F-), Nitrate (NO3-),Total Hardness, Alkalinity, Sodium (Na+), Potassium(K+), Carbonates(CO3-2), Bicarbonates (HCO-3) etc. with reference to BIS and WHO standards. It has been observed that most of the water samples have concentration of different parameters beyond the permissible limits. The ground water of the these blocks was not found suitable for drinking and other domestic purpose.

Biological parameters are important factor that determine quality of drinking water. It is more important than physical and chemical parameters in term of direct effect on human health. Some important biological characteristics affecting quality of drinking water includes bacteria, protozoa, virus and algae. Establishing a water treatment plant and creating public awareness can be some of the constructive efforts to obtain good water quality.

KEYWORDS: *physicochemical, biological, parameters, analysis, blocks, Ajmer, groundwater*

How to cite this paper: Kishan Gopal Jhanwar | Rajeev Mehta | Preeti Mehta "Physicochemical and Biological Parameters of Groundwater of 10 Blocks of Ajmer District, Rajasthan, India" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-5 | Issue-5, August 2021, pp.1799-1811, URL: www.ijtsrd.com/papers/ijtsrd45216.pdf

IJTSRD45216

INTRODUCTION

Water is one of the five (Earth, Air, water, fire and space) essential elements of life. The safe potable water is absolutely essential for healthy living. Ground water is ultimate and most suitable fresh water resource for human consumption in both urban as well as rural areas. There are several states in India where more than 90% population is dependent on groundwater for drinking and other purpose. Ground water is also being used frequently as the alternative source for agriculture and industry. Importance of ground water for existence of human society cannot be overemphasized. Water is one of the most important compounds to the ecosystem. Better quality of water can be described by its Physical, Chemical and Biological characteristics. But some correlations are possible among these parameters and the significant one would be useful to indicate quality of water. Due to increased population, industries, use of

fertilizers in agriculture and Man-made activity, drinking water gets contaminated and due to use of Contaminated Drinking water, Human Population Suffers From a variety of water borne diseases, so it becomes necessary to evaluate the Quality of Drinking water which should be done at regular intervals of time. It is difficult to understand The Biological Phenomena fully because the Chemistry of water reveals much about the metabolism of the ecosystem and explain the general Hydro biological relationship. The physicochemical and biological parameters of water and the dependence of all life process of these. This paper deals with analysis of physicochemical and biological parameters of groundwater of 10 blocks of Ajmer district.[1]

STUDY AREA

The 10 blocks of Ajmer district which are included in the study area are as follows:

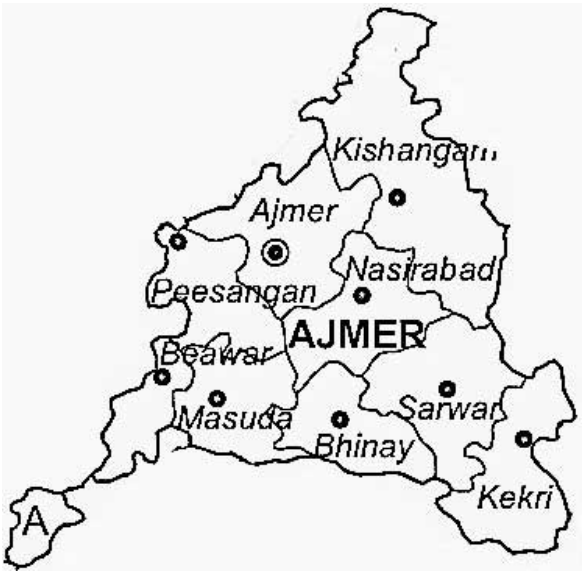
1. Ajmer -Ajmer is one of the 32 districts of Rajasthan State. It is situated almost in the center of the state. The district derives its name from the head quarter town of Ajmer. Before independence, Ajmer-Merwara was an isolated province of the British india.Groundwater samples were collected from Ajmer district for analysis.
2. Peesangan-Peesangan is a Tehsil in Ajmer District of Rajasthan State of India. The latitude 26.38°37'195'' and longitude 74.41°05'291'' are the geo-coordinates of the Peesangan tehsil. It belongs to Ajmer Division. It is located 31 KM towards west from District headquarters Ajmer, 180 km from State capital Jaipur towards East.
3. Kishangarh -Kishangarh (Rajasthan) is at 26028' N and 74052' E. Gundolav Lake is one of the many perennial shallow water bodies around Kishangarh, of which Hamir Pond, Santolav Pond, Ransamand Pond are important.However groundwater is to be analysed. About 1,254 bigha land in the basin of the Gundolav Lake is used for farming, when lake dried up. Due to multifold pressure of urbanization and industrialization, urban wastewater discharge, cloth washing activities, agricultural practices and construction of hotels and housing colonies, the groundwater greatly affected. [2]
4. Nasirabad-The largest Gas Plant in Asia is situated in Dilwara, Nasirabad. With the development of this gas plant, there are many new opportunities. The transportation system is a vital player in this because of the transportation of Gas and Petroleum products. The biggest manufacturing outfit in Nasirabad is Chandraprakash Laundry Soap, one of the biggest manufacturers of washing soap and detergent in Rajasthan.
5. Beawar - Beawar was the financial capital of Merwara state of Rajputana. As of 2011, the population of Beawar is 342,935. It is located 184 kilometres (114 mi) southwest of the state capital Jaipur, amidst Aravali hills. It is situated in a mineral-rich region having reserves of feldspar, quartz, asbestos, soapstone, magnesite, calcite, limestone, mica, emerald, granite, and masonry stone. Reserves of barytes, fluorite, wollastonite and vermiculite have also been found.
6. Arain-Arain is a Town in Arain Tehsil in Ajmer District of Rajasthan State, India. It belongs to Ajmer Division. It is located 46 KM towards East from District head quarters Ajmer. It is a Tehsil head quarter.
7. Masuda –Masuda block is near Ajmer. Fort Masuda is situated 54 kms away from Ajmer in Masuda. The fort was originally built around 1595 AD but it deteriorated fast and was in ruins very soon after. It was later restored and renovated by Nar Singhji Mertia (1583–1623). The magnificent fort now stands tall and has multiple compartments like the Kaanch Mahal, Bada Mahal, Chandra Mahal etc.[3]
8. Sarwar-Sarwar is an administrative subdivision of Ajmer district in the Indian state of Rajasthan. Sarwar is situated at North Latitude 26.07 and East Longitude 75.0. It has an average elevation of 337 meters (1105 ft) above its mass. Sarwar is situated at a distance of 16 km from Kekdi town and 64 km from Ajmer. Sarwar is a city and a subdivision of Ajmer district in the Indian state of Rajasthan. Sarwar is also a Municipality and Panchayat Samiti. It is a part of Kekri Vidarbha Assembly and Ajmer Lok Sabha constituency. Sarwar is 16 km from town Kekri and 64 km from Ajmer district.
9. Bhinay- Bhinay is a Town in Bhinay Tehsil in Ajmer District of Rajasthan State, India. It belongs to Ajmer Division. It is located 55 KM towards South from District head quarters Ajmer. It is a Tehsil head quarter.Bhinay Pin code is 305622 and postal head office is Bhinai Sobri (4 KM), Dhantol (6 KM), Chhachhundra (7 KM), Ekalseenga (11 KM), Tantoti (11 KM) are the nearby Villages to Bhinay. Bhinay is surrounded by Masooda Tehsil towards west, Hurda Tehsil towards South, Srinagar Tehsil towards North, Peesangan Tehsil towards North. Nasirabad,

Ajmer, Beawar, Shahpura are the nearby Cities to Bhinay.

10. Kekri-Kekri is located between the major cities of central Rajasthan – Ajmer (80 km), Jaipur (130 km), Kota (140 km), Bhilwara (100 km) and Tonk. Earlier this city was known as Kankavati Nagari, which was named after Princess Kankavati. The research work of the famous Jain scholar Pandit Milpachand Kataria is well known across the country. In Para village, an ancient temple of Lord Shiva is situated. Jain temple of Shri Shantinath Bhagwan is situated in Baghera Digambar village. There are many other temples, such as Charbhuja Temple, Bijnan Mata Temple, Shantinath Ji Digambar Jain Temple, Laxminath Ji Temple, Shiva Temple, Kakarishche Temple, and Mehandipur Balaji Temple. There is an ancient temple of Lord Devnarayan in Nayagaon of Meeno, 12 km away from Kekdi area, where a huge fair is held every year on Bhadrapada Shukla Saptami. The devotees who come on this day are offered food as holy prasad. And ask for blessings. The famous Varaha Avatar temple in Baghera village is worth visiting.[4]

OBSERVATIONS

This paper deals with analysis of physicochemical and biological parameters of groundwater of 10 blocks of Ajmer district which are explained above in Study Area. Water is universal solvent so it has the capability to dissolve nearly all natural compounds. So alarming salts contain in ground water due to local pollutants and affected the groundwater quality adversely. Hardness of drinking water is a problem found in both ground & surface water and may cause too many problem in human physiological system and domestic & industrial purpose. So attention on hardness of water and its management has become need of hour. Water samples were collected from tube well, open well and hand pumps.[5]

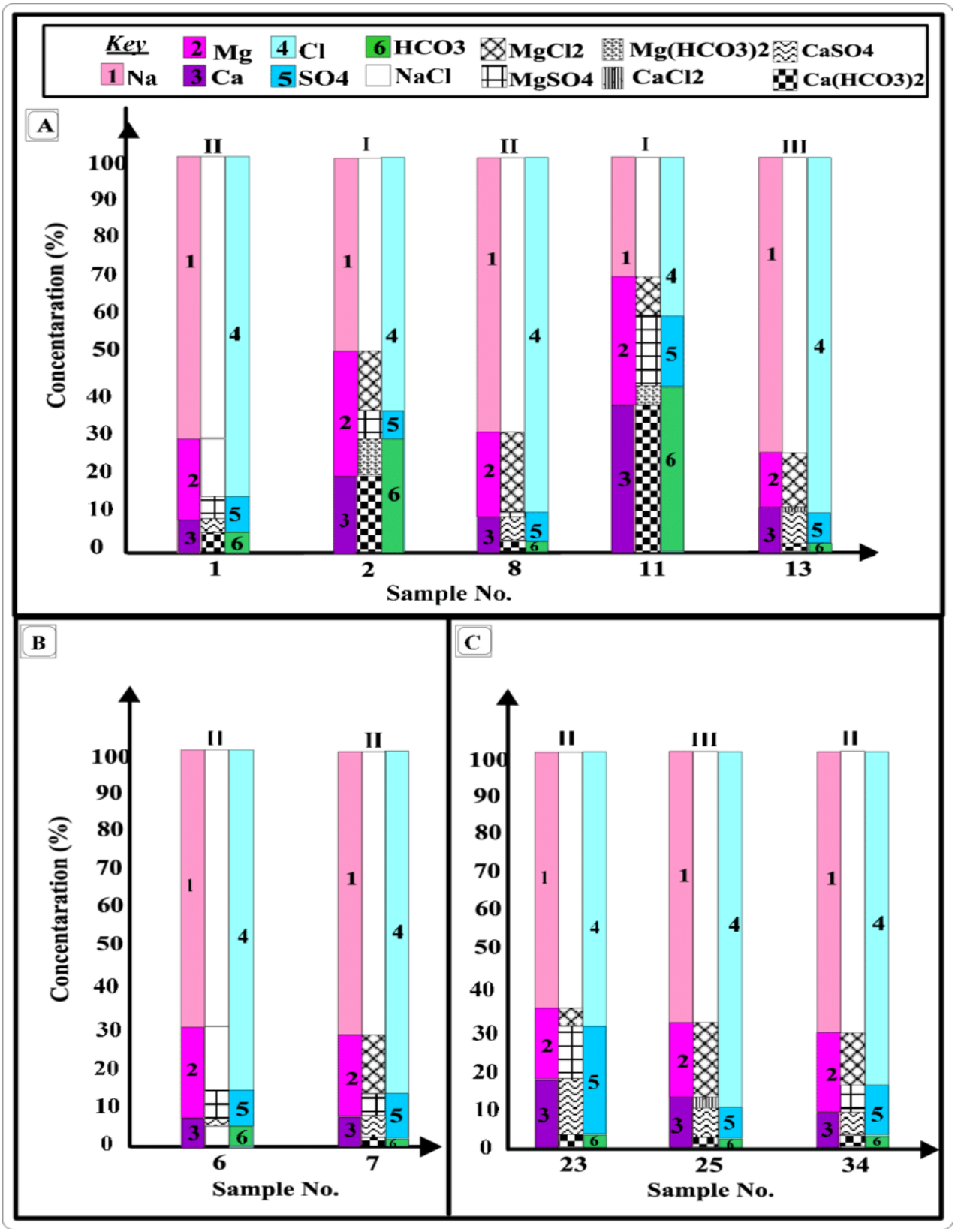


Map of Ajmer showing its blocks

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. For DO, BOD and COD separate 2 litres polythene bottles were used. 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, stoppered and sealed the bottle with parrafin 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 deionised distilled water. The pipettes and burette were rinsed with solution before final use. The chemicals and reagent were used for analysis were of annular grade.[6] The pH meter, conductivity meter, spectrophotometer, flame photometer instruments were used to analyze these parametres. The procedure for calculating the different parameters were conducted in the laboratory. The samples collected from 10 blocks of Ajmer were analyzed and results presented in Tables 1-10.

Table-1: Physicochemical parameters of groundwater samples of Ajmer

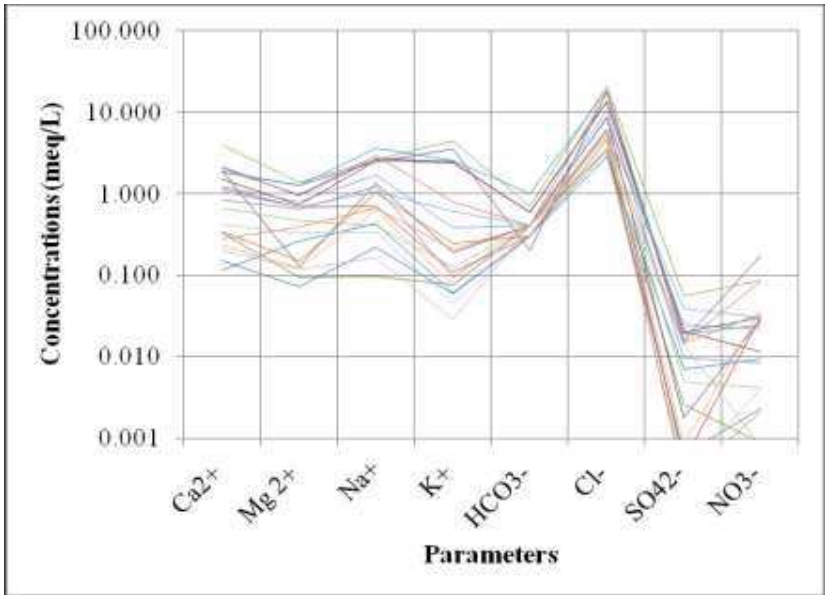
	Avg	Min	Max	Std dev
pH	7.9	7.4	8.6	0.3
EC	2,886	890	12,000	1,970
TDS	1,790	449	5,300	1,020
Na	433	67	1,530	316
K	18.5	2.7	117	17
Ca	84	20	228	33
Mg	51	12	170	32
Cl	540	70	2,230	395
SO_4	183	19	852	154
HCO_3	414	158	1,220	175
NO_3	149	5	1,050	181
F	2.2	0.1	6.6	1.4
HCO_3/Ca	5.5	2.0	28	3.6
Na/Ca	5.8	1.1	24.5	4.4



Graph showing Physicochemical analysis in Ajmer

Table-2: Physicochemical parameters of groundwater samples of Beawar

Water Quality Parameters		Lower Aquifer		Upper Aquifer		Surface Water		Drinking Water Standard		
								DoE (1997)	WHO (1993)	
		Range	Average	Range	Average	Range	Average		Max. Acceptable	Max. Allowable
Physical Parameters	pH	6.09-6.83	6.5775	7.18-7.47	7.356	6.8	6.8	6.5-8.5	6.5	8.5
	Temp. (°C)	26.60-28.10	27.30	26.10-26.30	26.20	29.5	29.5	20-30		
	TDS (mg/L)	143-1950	692	524-1705	1170	84.50	84.50	1000	1000	
	Hardness	115-744	328	79-237	149.50	21.40	21.4	200-500	100	500
Major Cations	Na (mg/L)	15-447	123.82	46-731	474.73	26.54	26.54	200	200	
	K (mg/L)	1.8-18.19	5.19	8.07-11.8	9.97	2.72	2.72	12		
	Ca (mg/L)	10-61	30.18	6.91-46.9	26.88	0.52	0.52	75		
	Mg (mg/L)	19-144	61.5	15.1-29.2	20.05	4.89	4.89	30-35		
Major Anions	HCO_3 (mg/L)	81-237	148.43	371-565	474.66	29	29			
	Cl (mg/L)	23-681	256.94	18-370	158.67	19	19	150-600	200	600
	SO_4 (mg/L)	5-54	10.05	5.5-6.5	5.8	2	2	400	200	400
	NO_3 (mg/L)	0.20-8.50	1.01	0.1-0.4	0.23	0.30	0.30	45-50	45	
Minor ions and Trace Elements	Fe (mg/L)	0.21-9.32	3.72	1.59-4.81	2.05	0.19	0.19	1-5	0.3	3
	Mn (mg/L)	0.0-0.05	0.02	0.02-0.30	0.10	0.048	0.048		0.5	
	As (mg/L)	<.01-0.47	-	0.32-0.64	0.51	0.02	0.02	0.05	0.01	
	Zn (mg/L)	0.01-1.67	0.17	-	-	-	-	5	3	
	Cu (mg/L)	<.01-0.08	0.013	-	-	-	-	1	2	
	Cr (mg/L)	<.01-0.05	0.010	-	-	-	-	0.05	0.05	

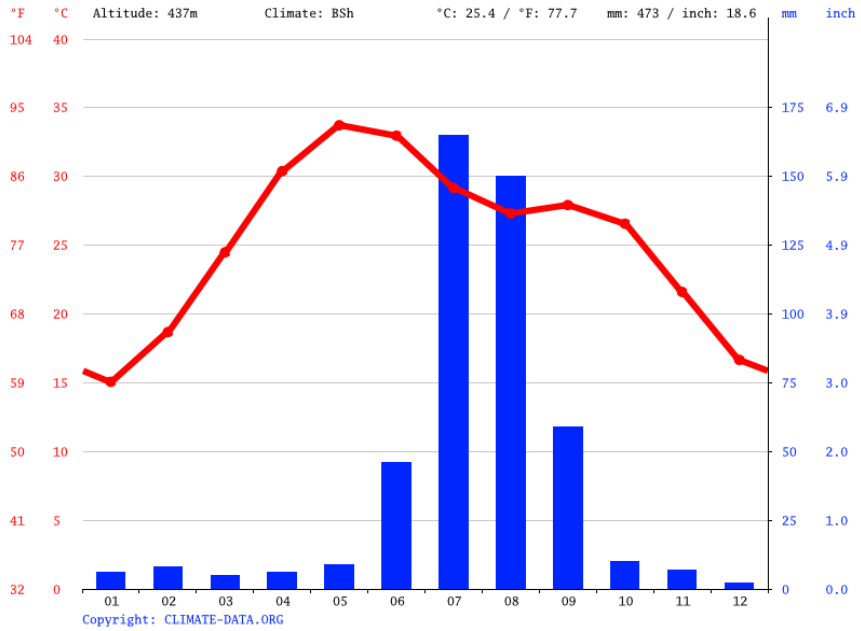


Graph showing Physicochemical characteristics in Beawar

Table-3: Physicochemical parameters of groundwater samples of Kishangarh

Parameters	Values from collected samples			Indian Standards		WHO Standards
	Min.	Max.	Mean	Acceptable	Max.	
EC	615	16140	4079.81	300	—	—
TDS	424	10555	2494.74	500	1500	500
pH	7.20	10.80	8.48	7-8.5	6.5-9.2	6.5-9.2
Na	53	3609	712.46	—	—	200
K	2	641	39.33	—	—	—
Ca	6	375	82.04	75	200	75
Mg	8	337	82.98	30	-	150
Cl	28	4733	882.6	200	1000	500
SO_4	6	2350	328.25	200	400	—
CO_3	24	842	84	—	—	—
HCO_3	46	1562	473.1	—	—	—
NO_3	2	386	80.05	100	50	—
F	0.24	17.60	3.71	1.0	1.5	—

* All the values are in mg/L, except pH and EC.



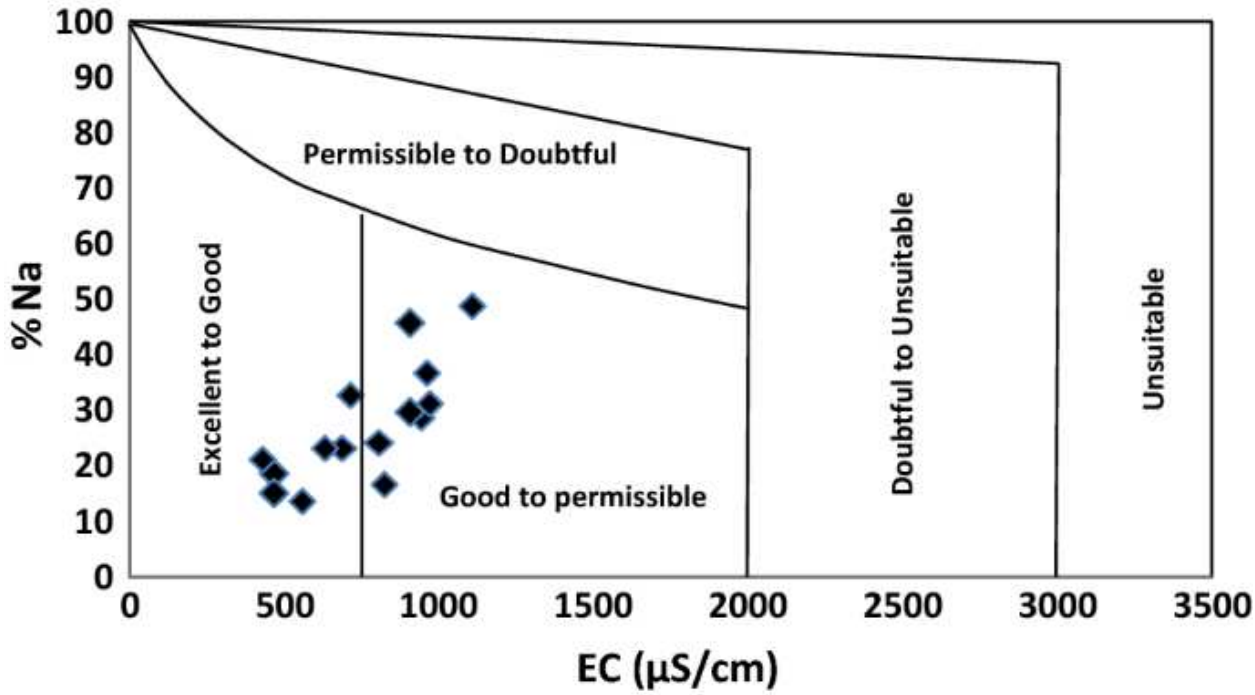
Graph showing weather averages in Kishangarh

Table-4: Physicochemical parameters of groundwater samples of Arain

standards

Parameter	Maximum	Minimum	Average	STD	NAFDAC, 2007	WHO, 2006
pH	4.61	3.94	4.381	0.198	6.5 - 8.5	6.5
Conductivity (µS/cm)	399.0	44.0	108.7	105.12	1000	-
TDS (mg/l)	209.0	22.0	54.35	55.156	500	-
Chloride (mg/l)	14.0	8.0	10.64	2.58	250	250
Sulphate (mg/l)	0.72	0.58	0.656	0.046	200	250
HCO_3 (mg/l)	0.82	0.001	0.559	0.385	500	-
Fe^{2+} (mg/l)	0.551	BDL	0.157	0.178	0.3	-
Mg^{2+} (mg/l)	1.306	0.247	0.607	0.31	30	50
Ca^{2+} (mg/l)	0.314	BDL	0.051	0.106	7.5	7.5
Na^{+} (mg/l)	1.792	BDL	0.57	0.738	200	200
K^{+} (mg/l)	3.688	BDL	0.528	1.139	-	200

BDL = below detectable limit; **STD** = Standard deviation



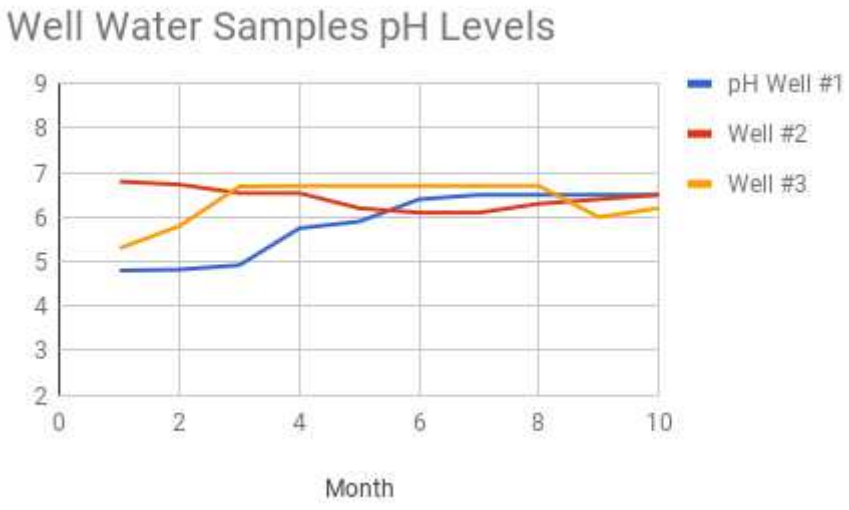
Graph showing groundwater quality in Arain

Table-5: Physicochemical parameters of groundwater samples of Bhinay

Parameters	pH	EC	DO	BOD	COD	Turbidity	Nitrate	Sulphate	Phosphate	Temperature
Ph	1.000									
EC	0.652	1.000								
DO	-0.581	0.232	1.000							
BOD	0.000	0.740	0.763	1.000						
COD	-0.990**	-0.716	0.489	-0.068	1.000					
Turbidity	0.538	-0.288	-0.988*	-0.829	-0.457	1.000				
Nitrate	-0.440	-0.837	-0.271	-0.824	0.448	0.392	1.000			
Sulphate	0.182	-0.346	-0.683	-0.429	-0.042	0.587	-0.043	1.000		
Phosphate	0.073	-0.642	-0.821	-0.798	0.055	0.792	0.411	0.885	1.000	
Temperature	-0.938	-0.734	0.381	-0.091	0.976*	-0.379	0.368	0.164	0.203	1.000

***. Correlation is significant at the 0.01 level (2-tailed).*

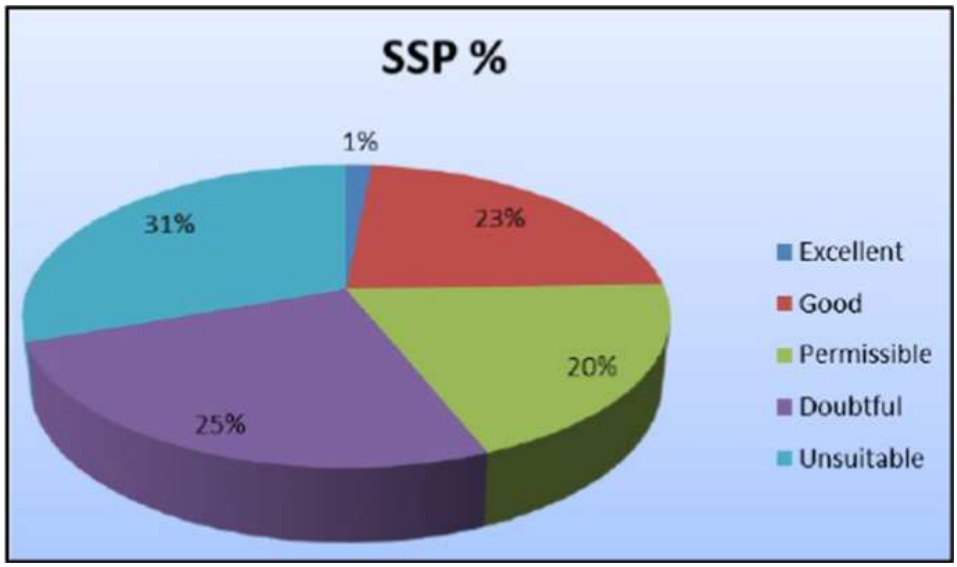
**. Correlation is significant at the 0.05 level (2-tailed).*



Graph showing well water samples in Bhinay

Table-6: Physicochemical parameters of groundwater samples of Sarwar

Parameter	Unit	Min	Max	Mean±SD	Iran permissible limit	WHO permissible limit
Temperature	℃	10.7	17.5	14.5±1	-	-
pH	-	7.3	8.4	7.6±0.21	6.5-9	6.5-8.5
Turbidity	NTU	0.4	2.5	0.94±0.35	≤1	≤5
Total alkalinity	mg/L($CaCO_3$)	86.6	210	179±25	-	-
Total hardness	mg/L($CaCO_3$)	90	220	191.6±32	500	-
Calcium hardness	mg/L($CaCO_3$)	70	201	151.6±28	-	-
Total dissolved solids	mg/L	99.6	445.7	251.6±66.6	1500	-
Bicarbonates	mg/L	121.24	307.8	269.85±51.6	-	-
Chloride	mg/L	31	110.9	51.34±14.6	400	250
Sulfate	mg/L	20	75	25±11.7	400	500
Nitrate	mg/L	7.4	25.6	15.5±7.7	50	50
nitrite	mg/L	0.001	2.1	0.89±0.08	3	3
Fluoride	mg/L	0.19	0.28	0.20±0.1	1.5	1.5
Calcium	mg/L	20.6	35.9	18.9±4.8	-	100-300
Magnesium	mg/L	11.8	28.9	21.5±2.8	-	-
Sodium	mg/L	10.7	50.9	17±7.7	200	200
Potassium	mg/L	1.6	7.9	4.5±1.7	-	-



Graph showing groundwater values in different sampling areas of Sarwar

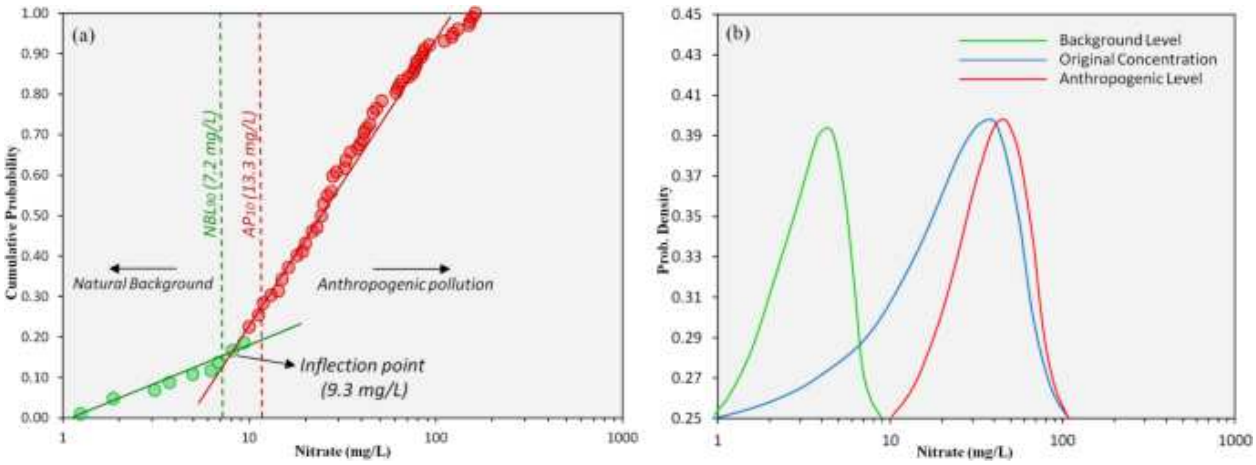
Table-7: Physicochemical parameters of groundwater samples of Kekri

Parameter	Pre-Monsoon		Post-Monsoon	
(mg/l)	Minimum	Maximum	Minimum	Maximum
Arsenic	0	0.02	0	0.001
Fluoride	0	1.3	0	1.4
Iron	0	1.02	0	1.1
Sulphate	0	425	0	400
pH	0	8.5	0	8.5
TDS	0	1000	0	807
Hardness	0	452	0	498
Alkalinity	0	575	0	400

Figure showing groundwater monitoring

Table-8: Physicochemical parameters of groundwater samples of Nasirabad

Parameter	Unit	Maximum	Mean	WHO 2017 Most desirable	WHO 2017 Not permissible
EC	µS cm^{-1}	3040	1150.1	<1500	>1500
TDS	mg l^{-1}	2128	805.1	<500	>1500
pH	—	8.13	7.5	6.5 to 8.5	<6.5 and >8.5
TH	mg l^{-1}	792	293.1	<450	>450
Calcium	mg l^{-1}	174.4	70.8	<75	>200
Magnesium	mg l^{-1}	85.44	27.9	<50	>150
Sodium	mg l^{-1}	300	116.6	<200	>200
Potassium	mg l^{-1}	100	25.0	<10	>10
Bicarbonate	mg l^{-1}	488	214.9	<300	>600
Chloride	mg l^{-1}	656	129.7	<200	>600
Sulphate	mg l^{-1}	395	133.5	<400	>400
Nitrate	mg l^{-1}	75	30.9	<45	>45
Phosphate	mg l^{-1}	2.9	0.3	<0.3	>0.3
Fluoride	mg l^{-1}	3.7	1.3	<1.5	>1.5

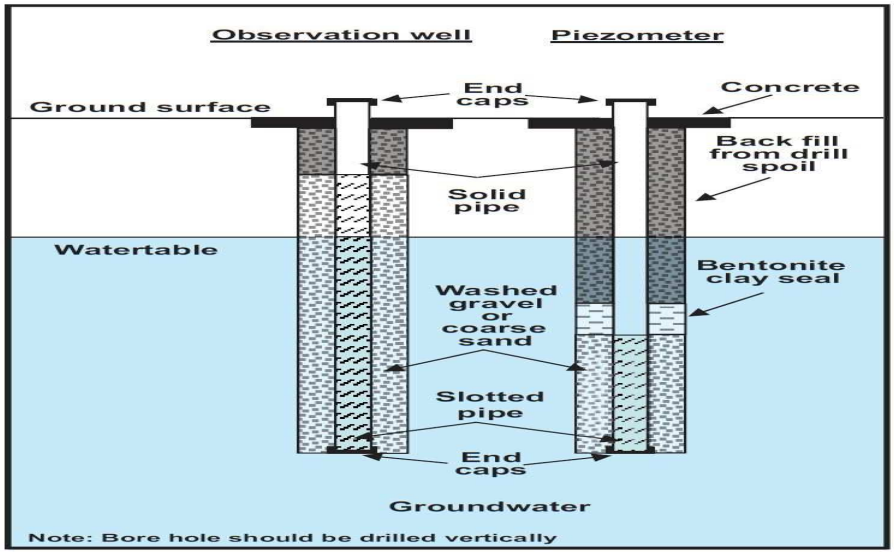


Graph showing anthropogenic nitrate in groundwater and health risk in Nasirabad

Table-9: Physicochemical parameters of groundwater samples of Peesangan

Parameter	Temperature	pH	EC	TDS	Turbidity	TH	Chloride	Alkalinity	Salinity
Temperature	1.00	-0.3848	-0.1313	-0.1661	0.1093	-0.0656	0.186	-0.636	-0.1305
pH		1.00	0.6117	0.6113	0.575	0.3323	0.3207	0.8143	0.6107
EC			1.00	.9999*	0.5586	0.763	0.7605	0.7426	0.9999*
TDS				1.00	0.5545	0.7599	0.7634	0.7412	0.9999*
Turbidity					1.00	0.8036	0.0415	0.6231	0.5505
TH						1.00	0.2444	0.6823	0.7562
Chloride							1.00	0.2215	0.7672
Alkalinity								1.00	0.7387
Salinity									1.00

**Highly significant correlation between EC & TDS, EC & Salinity, TDS & Salinity*

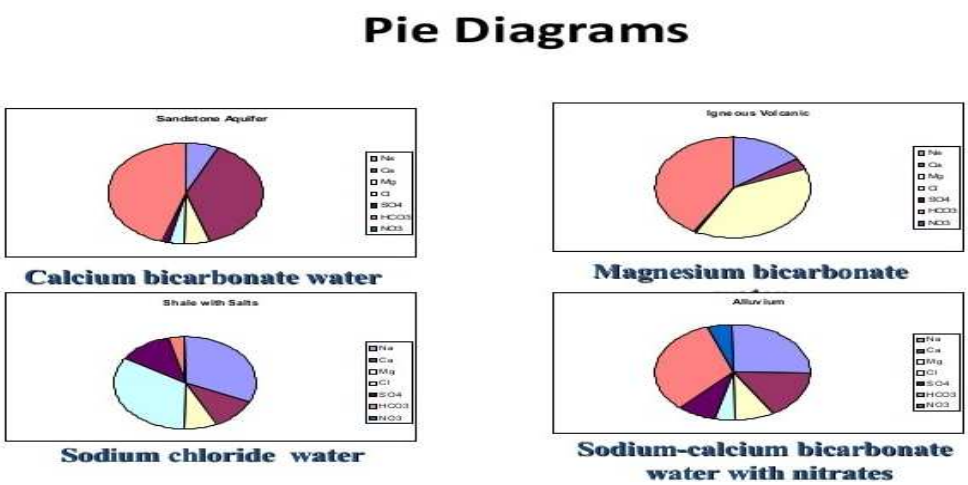


Groundwater monitoring in Peesangan

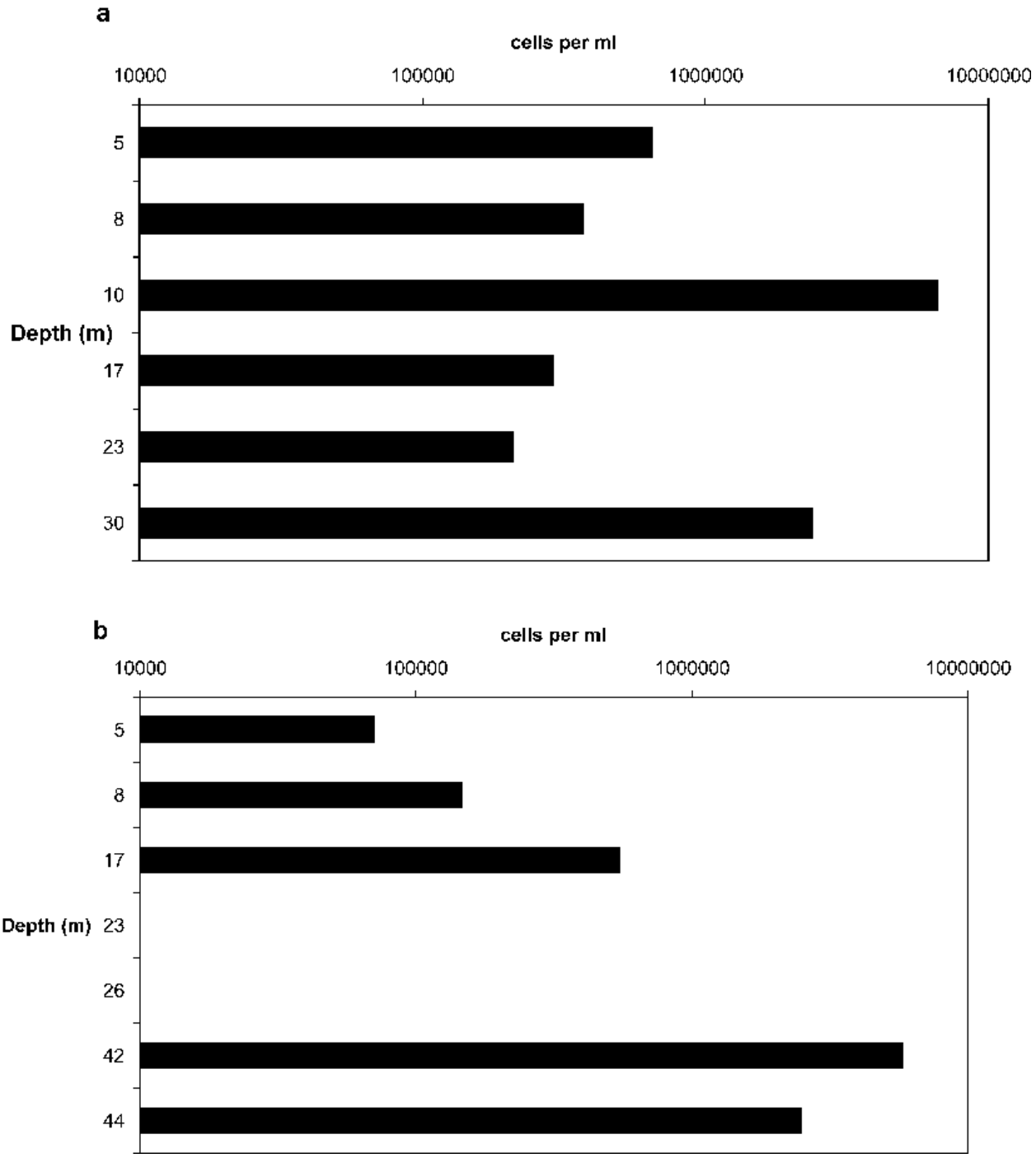
Table-10: Physicochemical parameters of groundwater samples of Masuda

Determinant	GW	WW
Color	Colorless	Lightly black
Odor	Odorless	Slightly unpleasant
p^H	7.5	8.2
Electrical conductivity (mhos cm^{-1})	573	1330
Total solids	988	2480
Total dissolved solids	542	1421
Total suspended solids	448	1070
Biological oxygen demand	16.75	155.18
Chemical oxygen demand	38.5	366
Calcium	23.98	157.05
Magnesium	26.0	132.0
Carbonates	19.32	94.85
Bicarbonate	68.00	219.20
Chlorides	74.66	103.70
Potassium	5.0	11.0
Nitrate-nitrogen	0.60	1.30
Phosphorus	0.07	0.89

(TS), total suspended solid (TSS), biochemical oxygen demand (BOD), chemical oxygen demand (COD), calcium (Ca^{++}), magnesium (Mg^{++}), chloride (Cl^{++}), potassium (K^+), carbonate (CO_3^{2-}), bicarbonate (HCO_3^-),



Graphs showing different concentrations of inorganic compounds in groundwater of Masuda



Graph showing Biological analysis (Microbial) of multi-level borehole samples from a contaminated groundwater system in Ajmer district

DISCUSSION

There are many pollutants in groundwater due to seepage viz. organic and inorganic pollutants, heavy metals, pesticides and fluorides. In the present study our aim is to assess the presence and extent of heavy metal concentration with physico-chemical quality of groundwater, due to pollution caused by various industries and around its adjoining areas. [7,8] The results revealed that most of the water samples were below or out of limit; according to the WHO standards. It is observed that the quality of groundwater is not suitable for drinking and domestic purpose. The negative correlations were found in 15 cases between Temperature and pH, Temperature and Na+, Temperature and Cl-, Temperature and F-, Temperature and SO4 -2, pH and Na+, pH and K+, EC and F-, TDS and F-, TH and F-, Na+ and F-, K+ and F-, Cl- and F-, Cl- and NO3 -, F- and SO4 -2. Some of the highly significant correlations were discernible between EC and TDS, EC and TH, EC and Cl-, EC and SO4 -2, TDS and TH, TDS and Cl-, TDS and SO4 -2, TH and Cl-, Na+ and K+, Cl- and SO4 -2. Poor positive correlation was found between Temperature and K+, pH and EC, pH and TDS, pH and TH, pH and Cl-, pH and F-, pH and NO3 -, pH and SO4 -2, EC and Na+, EC and K+, EC and NO3 -, TDS and Na+, TDS and K+, TDS and NO3 -, TH and Na+, TH and K+, TH and NO3 -, Na+ and Cl-, Na+ and SO4 -2, K+ and Cl-, K+ and SO4 -2, F- and NO3 -, NO3 - and SO4 -2. very negligible positive

correlation was observed between Temperature and EC, Temperature and TDS, Temperature and TH, Temperature and NO3 -, K+ and NO3 -, Na+ and NO3 -. [9,10] Higher values of certain parameters at certain hand-pumps indicate the unfitness of water for drinking purpose. Hence, it suggested that ground water source in the study area be monitored before the use for domestic and drinking purposes. It also suggested that more emphasis should be given to reduce TDS, TH, Cl- contents and NO3 - contents, where ever these crosses the limits of ISI standards.[11]

In case of biological analysis the water samples from Ajmer district were collected. Bacteriological analysis revealed that some ground water samples were highly contaminated. The probable reason for high bacterial load might be the location of ground water sources near septic tanks or sewage drains. *E.coli* was isolated from all ground water samples tested positive for MPN of coliforms, while some of the ground water samples were found to be contaminated by *Klebsiella* sp., and *Pseudomonas* sp.[12]

CONCLUSION

The behaviour of fluoride in natural water in terms of local hydrogeological setting, climatic conditions and agricultural practices. Present study is an attempt to assess quality of groundwater in 10 blocks of Ajmer district in Rajasthan to understand the Physico-chemical and biological status in groundwater. Ajmer district falls in the semi-arid tract of central Rajasthan and is geologically occupied by Precambrian rocks (granites, pegmatites, gneisses, schists etc) where groundwater occurs under unconfined condition. Dental and skeletal fluorosis are prevalent in the study area which can be related to the usage of high fluoride groundwater for drinking. The Quality of groundwater of Ajmer district in general varies from potable to saline. The shallow ground water aquifers are comparatively more deteriorated than the deeper aquifers. The total groundwater recharge during monsoon and non monsoon season through rainfall and other sources in Ajmer district is 353.7368 MCM. Considering the natural discharges @ 10%, the Net groundwater Availability comes out to the value of 320.6615 MCM. All blocks fall under over-exploited category having stage of groundwater development more than 100% which has been resulted due to depletion in water level.[13]

Almost entire district is facing groundwater scarcity problem, though water supply has solved drinking water problem to some extent in urban areas. The greater part of the district is occupied by hard formations so the well yields are very poor. As such the depth of weathered zone is generally restricted up to 50m. The deep-seated fractures below 100 m are very rare. This causes reduction in the well yield drastically during the summers creating acute water shortage of domestic water supply. However, in selective areas located on structural weak planes which are connected to some recharge source wells continue to yield moderate quantity of water. The deeper levels are either devoid of ground water or of poor quality (brackish to saline). Alluvium occurs at limited places along the major drainage/ valley fills and has shallow thickness. The well yield varies considerably year to year in different parts of the district and over the season. Thus the availability of surface as well as ground water is very scarce in low rainfall years & especially in summer months (Pre-monsoon)[14]

REFERENCES

[1] APHA 1992. Standard Methods for Examination of Water and Wastewater. 18th Ed., Washington DC.

[2] Ahmed, K. and Begum, J. 2002. Bacteriological quality of water in hill stream of Khanapara during different seasons. Nat. Env. and Poll. Tech., 1(2): 171-173.

[3] Bhargava, R. K., Saxena, S.C. and Thergaonkar, V.P. 1978. Groundwater quality in Ajmer district. Indian Journal Environmental Health, 20: 290-299. BIS: 10500 1991. Specification for Drinking Water. Bureau of Indian Standards, New Delhi.

[4] Chaudhary, V., Jacks, G. and Gustafsson, J.E. 2002. An analysis of groundwater vulnerability and water policy reform in India. Environmental Management and Health, 13(2): 175-193.

[5] Government of India. 2004. Drought- 2002. Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi.

[6] Handa, B.K. 1975. Geochemistry and genesis of fluoride containing groundwaters in India. Groundwater, 13: 275-281.

[7] Khanna, R.K., Rathore, R.S. and Sharma, C. 2008. Solar still an appropriate technology for potable water need of remote villages of desert state of India. Rajasthan. Desalination, 220(1-3): 645-653.

[8] Kumar, S., Gupta, R. K. and Gorai, A.C. 2008. Nitrate pollution in dug well water of Putki-Balihari colliery area of Dhanbad district (Jharkhand). Asian Journal of Experimental Science, 22(1): 161-164.

[9] Majumdar, D. 2003. The blue baby syndrome: Nitrate poisoning in humans. Resonance, 8(10): 20-30.

[10] Patra, R.C., Dwivedi, S.K., Bhardwaj, B. and Swarup, D. 2000. Industrial fluorosis in cattle and buffalo around Udaipur, India. Science Total Environment, 253: 145-150.

[11] Raviprakash, S. and Krishnarao, G. 1989. The chemistry of ground waters of Parvada area with regard to their suitability for domestic and irrigation purposes. Indian Journal of Geochem., 4: 39-54.

[12] Singh, D.K. and Singh, A.K. 2002. Groundwater situation in India: Problems and perspective. International Journal of Water Resources Development, 18(4): 563-580.

[13] WHO 1971. International Standards for Drinking Water, 3rd Ed. World Health Organization, Geneva.

[14] WHO 1984. Guidelines for Water Quality. Vol. 1, World Health Organization, Geneva.