International Archive of Applied Sciences and Technology
Int. Arch. App. Sci. Technol; Vol 6 [1]March 2015: 17-21

[ISO9001: 2008 Certified Organization]
www.soeagra.co/iaast.html

IAAST
ONLINE ISSN 2277- 1565
PRINT ISSN 0976 - 4828

CODEN: IAASCA **ORIGINAL ARTICLE**

Assessment of Water Quality Using Physico-Chemical of Ground Water of Bhilwara city and Periphery Villages (Rajasthan)

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ABSTRACT
Water is an essential natural recourse for the existence of growth and development of life on the earth. The demand for water has increased over the years, and this led to a water scarcity. The present study is focused on hydrochemistry of ground water in Bhliwara city and Periphery Villages (Rajasthan) to assess the quality of groundwater to evaluate the suitability of water for domestic uses. The 20 water samples from open well, hand pump, tube well were analyzed for physico-chemical parameters such as pH, EC,TDS, Ca^{+2}, Mg^{+2},Cl^{-} , CO_3^{-2}, NO_3^{-}, F^{-} and alkalinity. The concentrations of physical and chemical constituents in the water sample were compared with the WHO standard to know the suitability of water for drinking. The results reveal that ground water of the Bhliwara city and Periphery Villages (Rajasthan) is not suitable for drinking, it needs some degree of treatment before use.
***Key Words**- Hydrochemistry, physico-chemical, TDS, EC, WHO standard*
Received 20/01/2015 **Revised 20/02/2015** **Accepted 04/03/2015**

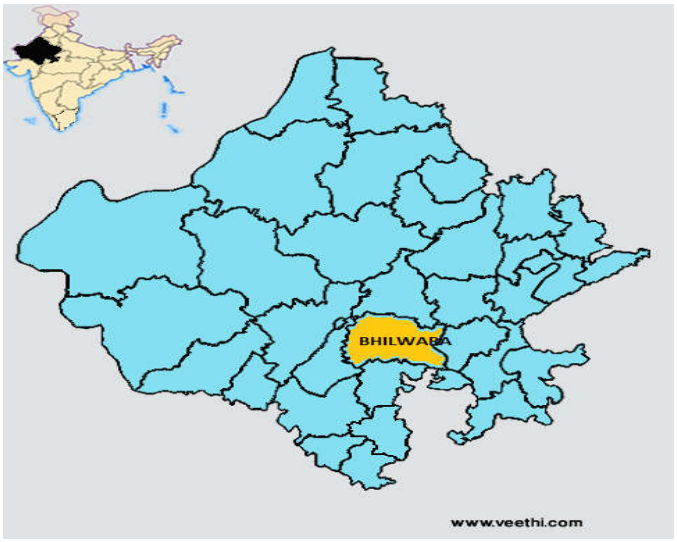
Citation of this article
P. L. Meena, N. Kumar, A. S. Meena and K. S. Meena. Assessment of Water Quality Using Physico-Chemical of Ground Water of Bhilwara city and Periphery Villages (Rajasthan). Int. Arch. App. Sci. Technol; Vol 6 [1] March 2015: 17-21. DOI.10.15515/iaast.0976-4828.6.1.1721

INTRODUCTION

Ground water is the main source of drinking, irrigation and industrial purpose all over the world. In last few decades the demand for fresh water tremendously increased due to rapid growth of population. The accelerated industrialization and urbanization renders ground water susceptible to pollution. Water contamination is a consequence of human settlement, civic culture, Agricultural and industrial activities. Water quality of receiving water bodies such as rivers and lakes is critically important because it is one of the most essential resources for human existence and settlement. However, rapid growth of population and increase of urban activities significantly influences the water quality of receiving water bodies [1-2]. This is mainly due to the deterioration of water quality due to the higher pollutant loads resulting from various point and non-point sources of pollution. As noted by several researchers, point source of pollution primarily includes direct and uncontrolled discharges from different land use types such as residential, industrial and commercial land uses [1]. Furthermore, due to temporal and spatial variations in water qualities, monitoring programs that involve a large number of physicochemical parameters and frequent water samplings at various sites are mandatory to produce reliable estimated topographies of surface water qualities[3]. The results are usually compiled into a large data matrix, which requires sophisticated data interpretations [4]. A variety of mathematical assessment models, including water quality index models [5], structurally dynamic models [6], fuzzy synthetic evaluation approach [7], generalized logistic models [8], Bayesia models [9], etc, have been used to study the physicochemical interrelationships and processes. However, these methods aren't useful for large-scale and long-term monitoring database. Because of the limitations of these methods, the multivariate statistical analysis methods have the advantage of explaining complex water quality monitoring data to get a better understanding of the ecological status of the studied systems [10]. The multivariate statistical analysis has been successfully applied in a number of hydrogeochemical studies [11-14]. All the studies show that multivariate statistical analysis can help to interpret the complex data sets and assess the water quality, and it is useful in verifying temporal and spatial variations caused by natural and anthropogenic factors linked to seasonality. The rate of increase in urban, agricultural, and industrial activities has raised

scientists' concerns about environmental issues and in particular about water pollution [15]. Wastewater from these activities may contain various heavy metals including Zn, Cu, Pb, Cd, Ni, As, Al, depending upon the type of activities it is associated with16. These elements accumulating in groundwater induce a potential contamination of food chain and endanger the ecosystem safety and human health [17]. Thus, the investigation and management of water resources quality is important. The first presentation of water quality standard was made in 1914 by USPHS the Fluoride concentration laid down by USPHS (1962) [18], WHO (1962) [19] and ICMR (1962) [20]. The present study is analysis physico-chemical of ground water of Bhilwara city and periphery villages (Rajasthan) has been taken up to assess the quality of ground water for its safer use.

STUDY AREA



Bhiwara is situated between 25.00 to 27.50 north and 74.03 to 75.25 east longitude. It is 100 meters above the sea Ievel and Known for its textile Industries. It is bounded on the north by Ajmer District, on the east by Bundi District, on the south by Chittorgarh District, and on the west by Rajsamand District

MATERIAL AND METHODS

Samples of study area were collected from open wells, bore wells and hand pumps waters in polyethylene bottles to ensure that they will not get contaminated with heavy metals from the sampling and storage equipments. The parameters of samples such as Alkalinity, Electrical conductance, pH, Nitrate, TDS and Chloride were analyzed by conventional methods. Fluoride (F^-) will be analyzed by spectrophotometric methods. Total Hardness was analyzed by EDTA-Titrimetric methods.

RESULTS AND DISCUSSION

The physical and chemical parameters of ground water of Bhilwara city and periphery villages (Rajasthan) were analyzed for assessment of water quality. The results are mention in Table 1 and Figure 1, 2, 3 and 4.

Table 1: Physico-Chemical parameters of Bhilwara city and periphery villages.

	Location	pH	EC	TDS	F^-	Cl^-	NO_3^-	Alkalinity	Ca^{+2}	Mg^{+2}	CO_3^{2-}
OW1	Rampuriya	7.3	899	620	1.4	165	31	302	122	145	265
OW2	Gurlan	7.4	1080	745	1.5	142	36	311	100	142	235
OW3	Badamahua	7.5	870	592	1.1	92	15	272	52	102	154
OW4	Bhopalgarh	7.6	925	630	1.3	75	26	365	60	105	162
OW5	Deoli	7.5	1070	725	1.0	108	8	460	102	135	232
OW6	Haled	7.4	1450	985	1.5	385	21	632	98	265	361
OW7	Mandpiya	7.2	1190	812	1.8	275	11	345	61	142	200
OW8	Sabalpura	7.6	900	605	1.6	132	11	385	72	112	182
OW9	Karoi	7.3	870	595	1.4	192	16	352	140	70	210
OW10	Bardod	7.5	940	641	1.6	191	25	280	72	141	211
OW11	pur	7.6	630	430	1.5	60	15	161	82	100	162
TW1	Tilak Nagar	7.8	3732	2525	0.9	1060	25	821	241	441	685
TW2	Sanjay Colony	7.8	2600	1775	1.1	660	10	642	165	400	560
TW3	Transport Nagar	7.5	1324	910	1.2	302	11	620	107	142	245
TW4	Deoli	7.5	1221	825	1.3	195	9	340	10	220	229
TW5	Hamirgarh	7.6	930	632	1.7	215	19	308	111	365	311
HP1	Deoli	7.5	1950	1230	1.8	350	12	450	160	230	295
HP2	Badamahua	7.3	1562	910	1.9	210	7	525	130	210	285
HP3	Gurlan	7.1	1225	820	1.5	180	17	345	190	260	354
HP4	Rayala	7.4	1362	975	1.4	150	18	350	200	265	360

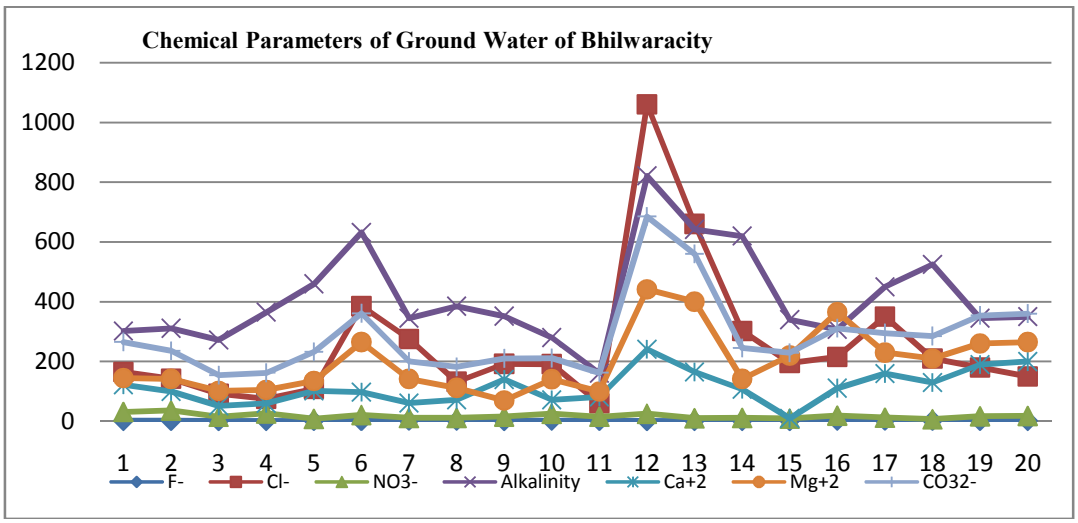


Figure 1: Chemical parameters of ground water of Bhilwara city and periphery villages.

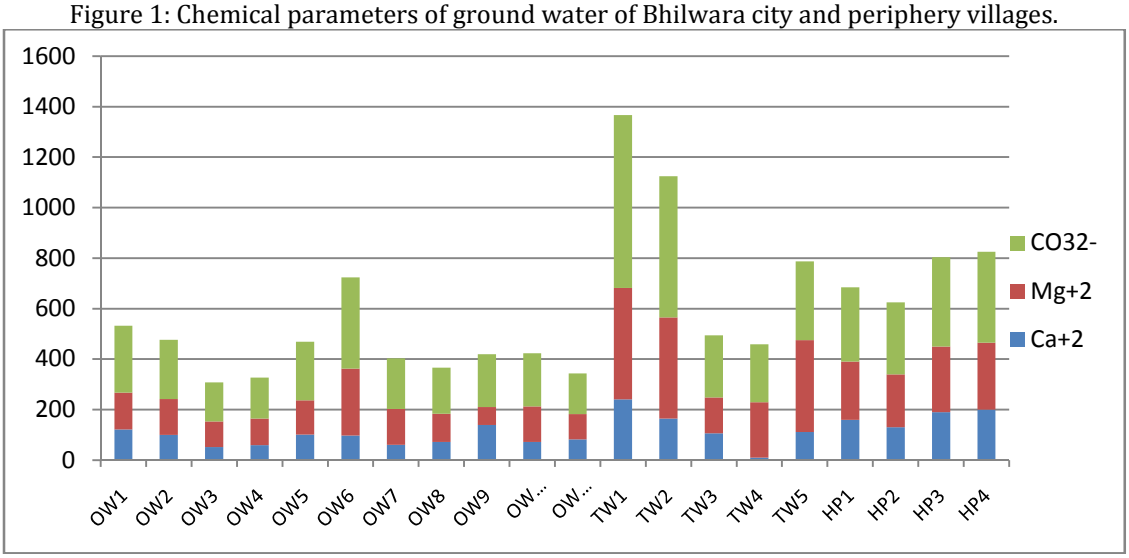


Figure 2: Chemical parameters (Total Hardness) of ground water of Bhilwara city and periphery villages.

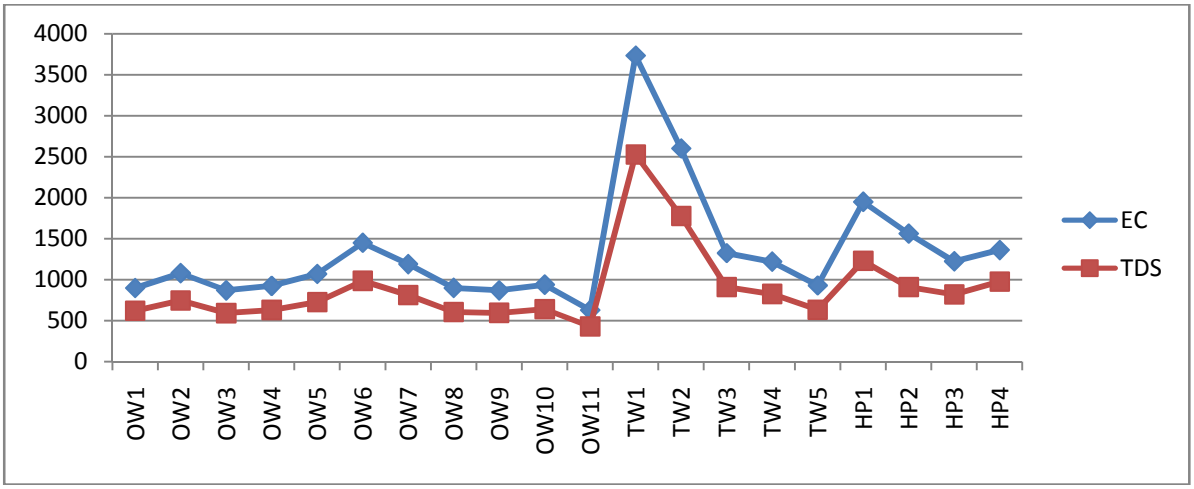


Figure 3: Physical parameters (EC &TDS) of ground water of Bhilwara city and periphery villages.

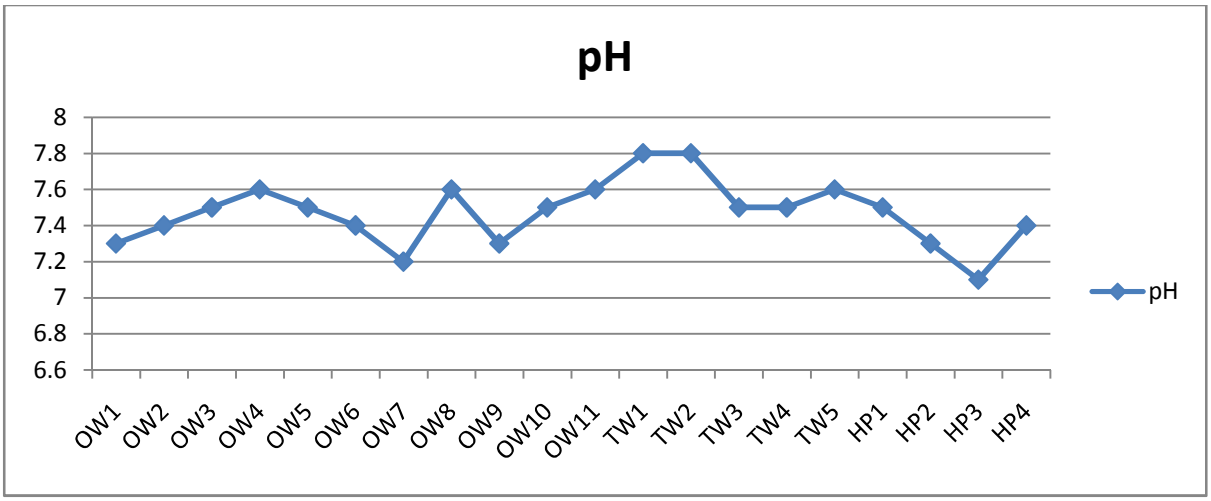


Figure 4: Physical parameter (pH) of ground water of Bhilwara city and periphery villages.

pH

pH of study area vwas alkaline values ranges from 7.1 to 7.8 The maximum pH value (7.8) was recorded in sample TW-1 and TW-2 and minimum (7.1) in sample HP-3, Most of bio-chemical and chemical reactions are influenced by the pH.

Electrical Conductance

The Electrical Conductance fluctuate from 630 µΩ/cm to 3732 µΩ/cm the maximum value 3732 µΩ/cm was recorded in sample OW-11 and the minimum value 630 µΩ/cm was recorded in sample TW-1.

Total Dissolved Solids

The total dissolved solids fluctuate from 430 mg/l to 2525 mg/l the maximum value (2525 mg/l) was recorded in sample OW-1 and the minimum value 430 was recorded in sample TW-11.

Nitrates

The values of nitrate ranges from 7 mg/l to 36 mg/l. the maximum value (36 mg/l) was observed in sample OW-2 and the minimum (7 mg/l) in sample HP2.

Alkalinity

The values of alkalinity ranges from 161 mg/l to 821 mg/l. the maximum value (821mg/l) was observed in sample TW-1 and the minimum (161 mg/l) in sample OW11. It is composed primarily of carbonate (CO_3^{2-}) and bicarbonate (HCO_3^-), alkalinity acts as a stabilizer for pH. Alkalinity, pH and hardness affect the toxicity of many substances in the water.

Chlorides

The values of chlorides range from 60 mg/l to 1060 mg/l. The maximum value (1060 mg/l) was recorded sample TW1 and minimum value (60 mg/l) in sample OW11.

Fluorides

The values of Fluorides range from 0.9 mg/l to 1.9 mg/l. The maximum value (1.9 mg/l) was recorded in sample HP2 and minimum value (0.9 mg/l) in sample TW1.

Ca^{+2}

The values of Calcium range from 10 mg/l to 241 mg/l. The maximum value (241 mg/l) was recorded in sample TW1 and minimum value (610 mg/l) in sample TW4.

Mg^{+2}

The values of Magnesium range from 70 mg/l to 441 mg/l. The maximum value (441 mg/l) was recorded sample TW1 and minimum value (70 mg/l) in sample OW9.

CO_3^{-2}

The values of Carbonate range from 154 mg/l to 685 mg/l. The maximum value (685 mg/l) was recorded in sample TW1 and minimum value (154 mg/l) in sample OW3.

CONCLUSIONS

On analysis of data from water samples, it concluded that ground water of Bhiwara city and periphery villages (Rajasthan) is not only very good quality but also potable. The population living in the Bhiwara city and periphery villages should be made aware about water born disease and purification possibilities and prospects of ground water of study area.

ACKNOWLEDGEMENT

The authors are grateful to Head Department of Chemistry, M. L. S. University, Udaipur for providing necessary Research Facilities to conduct this work.

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