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ANALYSIS OF DRINKING WATER QUALITY OF RAJASTHAN DISTRICTS

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ABSTRACT
Rajasthan is known as "the land of king" and it is the largest state of the republic of India in terms of geographical spread. Rajasthan was formed on 30 march-1949. It is situated in the North-Western part of India having total area is around 3, 42,239 Sq. Km. which represents 10.41% of total area of the country and population of 6.86 Crores spread over in 44,672 villages, which is 5.67% of nations population but being just available 1% of the total water resources of the country. A systematic and well planned study carried out to make assess the water quality of Rajasthan districts. In this paper it is found that water parameters are very much varied from their permissible limit. Mainly physic-chemical parameters like pH, TDS, Conductivity, alkalinity, salinity, hardness, calcium, magnesium, chromium, sulphate, iron, sodium, potassium, nitrate, and fluoride studied. Results of these parameters are very much varying among themselves. Such as if we talk about pH then we found that its value were from 3.05, 5.41, 8.52 in places like Churu, Alwar and Jodhpur etc which shows extent of variation of parameter.
KEYWORDS: parameters, resources

INTRODUCTION
The determination of groundwater quality for human consumption is important for the well being of the ever increasing population (Ishaku, 2011). The supply of good quality water is one of the important components of groundwater protection and conservation strategies and therefore useful in the planning and management of groundwater. Groundwater quality depends on the quality of recharged water, atmospheric precipitation, inland surface water and subsurface geochemical processes (Reza and Singh, 2010; Vasanthavigar et al., 2010). The authors further stressed that temporal changes in the origin and constitution of the recharged water, hydrologic and human factors may cause periodic change in groundwater quality. Water pollution not only affects water quality but also threatens human health, economic development, and social prosperity (Milovanović , 2007). Hence, evaluation of groundwater quality status for human consumption is important for socio-economic growth, development and also for establishing a database for planning future water resource development strategies.

Physicochemical quality of water adversely affected by many reason one of the reason is that when industrial sewage and municipal waste gets added to water. So it is necessary to examine the water of that area. For analysis purpose Rajasthan state selected in which district like Jaipur, Ajmer, Pali, Jodhpur, Churu, Jhunjhunu, Alwar, Bharatpur, karauli, Sikar covered by me. From these districts two points selected for sampling. One point was Railway station and other was bus stand. The purpose for selecting railway station and bus stand was that many people used it as source to quench their thirst. Result obtained shows that the parameters which are tested by me having variation among themselves. Testing is performed by use of titration, Spectrophotometer, water-analyser kit, flame Photometer, ion-selective method. For meeting health requirement it is necessary that parameter should be in desirable limit, but after analysis it is obtained that parameters are not in permissible range.

REVIEW OF LITERATURE
Subbarao and Subbarao (1995) have studied the conductivity and chloride concentration. They reported that many groundwater sources have crossed the health criteria due to urban factors like landfill leachate, domestic sewage and septic tanks. Suryanarayana (1995) has suggested that the water tends to be more

alkaline when it possesses carbonates

Datta and Natrajan (1996) have analysed the drinking well and tap water quality in connection with the high incidence of gastrointestinal diseases and cholera epidemics in Pondicherry. Richariya and Mishra (1998) have reported that groundwater has become a great problem in Rewa area according to bacterial pollution due to sewage of polluted surface water from industries, mining domestic wastes, causing various water borne diseases.

Verma and Thakur (1998) have studied the water quality of different water sources viz., municipal water supply, wells, borewells and river water at Ghatsila (Jamsedpur, Bihar), also indicate that the industrial influents released by a giant metal processing unit contaminate the water sources and make them unsuitable for drinking purpose. Kumar and Siddiqui (1998) have studied the quality of drinking water in and around Ranchi.

Pande (2000) has studied of surface water, sediments and ground water of river Ramganga at Moradabad. Aswathanarayana (2002) has studied the utility of groundwater available is dependent on its physical, chemical and bacteriological properties. Spatial and temporal distribution of groundwater quality is a function of climate (precipitation and evaporation), topography (slope which affects the residence time of groundwater), geology of the area (mineralogical and chemical composition of rocks and soils with which groundwater is in contact) etc.

Suthar et al. (2005) have conducted study of ground water quality of Shri Ganga Nagar city, Rajasthan. Agarkar and Kulkarni (2005) have evaluated the status of drinking water quality in school in Buldana District of Maharashtra. Sandhya (2005) has studied the presence of iron in groundwater can be attributed to the dissolution of rock and minerals (pyroxenes, pyrite, magnetite and haematite), acid mine drainage, sewage and industrial effluents.

Kumari and Jha (2009) have studied the assessment of drinking water quality in and around Patna town and they found that the maximum concentration of hardness in summer season (pre monsoon). Kavitha and Elangovan (2010) have studied the ground water quality characteristics at Erode district, Tamil Nadu, India. Rajkumar et al. (2010) have studied the groundwater contamination due to municipal solid waste disposal–AGIS based study in Erode city. Rajamanickam and Nagan (2010) have studied the groundwater quality modelling of Amaravathi river basin of Karur district, Tamil Nadu

Prajapati and Rokde (2011) have studied the quality of drinking water of potable water of southern Indore city, M.P., India. Singh et al. (2011) have studied the assessment of groundwater resources of Panandhro lignite mining region, Gujarat state, India.

Prajapati and Bhagore (2012) have studied the microbiological study of drinking water of Dhar city and adjacent villages. Mishra et al. (2012) have studied the assessment of groundwater quality in Shivpuri town, Madhya Pradesh, India. They reported the WQI range from 30.80 to 70.58, 34.58 to 70.22 and 33.02 to 69.97 in rainy, winter and summer seasons respectively.

Shrivastava and Pandey (2013) have studied the Physico-chemical and microbiological quality evaluation of groundwater for human domestic consumption in adjoining area of Omti Nallah, Jabalpur (M. P.), India. Shende et al. (2013) studied the Laboratory studies on water quality assessment of groundwater of open dug wells and surface water of Lake Waddepally in Warangal city, India. Hassan et al. (2013) studied the Physico-chemical assessment of groundwater quality of Waluj industrial area, Aurangabad, Maharashtra. Hazarika and Bhuyan (2013) have studied the fluoride, arsenic and iron content of groundwater around six

selected tea gardens of Lakhimpur district, Assam, India. Nirmala et al. (2013) have studied the Physico-chemical analysis of selected groundwater samples of Tumkur district, Karnataka. Narsimha et al. (2013) have studied the Hydro chemical concept of groundwater in and around Atmakuru area, Anantapur district, Andhra Pradesh, India.

MATERIAL AND METHOD

Study area

Main districts of Rajasthan were selected for sampling. Name of the districts where sampling done are following: Jaipur, Ajmer, Churu, Alwar, Jodhpur, Pali, Bharatpur, Jhunjhunu, sikar, karauli. In districts like Jhunjhunu and karauli railway stations are under construction. Along all district [Hindaun] a village also covered for accurate calculation in karauli district.

Sample collection and Location

Sample collection was done in that area which were close to my institute. First sampling was performed in Ajmer which was approximately 30 to 35 km form my institute after that Jaipur was selected which was around 120 km from Ajmer and 95 km form my institute. After that Sikar, Jhunjhunu, Alwar selected as next sampling points. To avoid contamination from dust, bottles were tightly packed so no entry of contaminant to bottle take place.

Laboratory method

There are many methods to test parameters but the method which was used by me in laboratory as follows: pH- preparation of buffer solution of pH 7 and 9 to calibrate the instrument. For TDS analysis KCL solution used to calibrate the instrument. While for salinity, alkalinity, hardness titration method used while the parameters for which machine like spectrophotometer and flame photometer used were chromium, ferrous, sulphate, sodium, potassium. But in case of fluoride and nitrate determination ion selective electrode instrument bring in use.

RESULTS

The maximum minimum and average values of parameters are given below in table 1:

Table 1

Parameters	Max.	Min.	Avg.
pH	8.52	3.05	6.87
TDS(ppm)	3240	186	1286
Salinity(mg/l)	781	71	364
Alkalinity(mg/l)	580	20	196
Hardness(mg/l)	1100	70	400
Calcium(mg/l)	440	28	160
Mg(mg/l)	993	63	360
Cr(mg/l)	0.15	0.132	0.13
Iron(ppm)	0.34	0.22	0.24
Nitrate(ppm)	255	7.86	82.3

Above parameters maximum minimum and average values are given in which many parameters are beyond the permissible limit. The parameters which are exceeding are pH, TDS, Nitrate, fluoride, Hardness, Calcium, Magnessium, Salinity, Alkalinity etc.

Table 2

parameters	JP (RS)	JP (BS)	AII (RS)	AII (BS)	JNJ (BS)	SI (RS)	SI (BS)	MWR (RS)	JU (BS)	JU (RS)	CUR (BS)	PALI (BS)
pH	7.23	7.38	7.25	7.75	8.13	7.5	5.45	7.5	8.52	8.07	6.42	6.04
TDS(ppm)	1120	910	530	407	850	1660	1260	2730	186	321	1460	342
salinity(mg/l)	426	355	71	355	142	497	355	710	142	213	355	71
alkalinity(mg/l)	120	150	120	90	250	130	190	580	70	80	20	90
hardness(mg/l)	590	550	530	130	70	470	320	320	120	110	130	150
sulpahte(ppm)	0.5	0.506	0.506	0.512	0.451	0.512	0.41	0.5	1.006	0.68	0.461	0.5
calcium(mg/l)	237	220	212	52	28	188	128	128	48	44	52	60
Mg(mg/l)	532	496	478	117	63	424	289	289	108	99	117	135
Na(ppm)	2.8	2.2	2.3	1.03	5	5	4.7	9.3	0.58	1.66	6.8	0.96
K(ppm)	6.7	6.9	19.2	3.7	0.67	5.2	3.1	3.6	3.3	6.9	2.9	3.2
Cr(ppm)	0.144	0.145	0.135	0.137	0.142	0.15	0.14	0.132	0.133	0.135	0.137	0.135
Fe(ppm)	0.262	0.226	0.235	0.235	0.245	0.232	0.23	0.284	0.242	0.242	0.239	0.232
nitrate(ppm)	147	179	29	7.86	75	70.6	50.6	178	8.18	29.9	77.8	11.6
fluoride(ppm)	0	0	0	0	5.12	0	0	2.6	0	0	2.24	0

Table 3

Parameters	CUR (RS)	AWR (RS)	AWR (BS)	BTE (BS)	BTE (RS)	HAN (RS)	HAN (BS)	KLI (BS)	GW (RG)	GW (kC)
pH	3.05	5.41	7.2	7.94	6.2	6.48	6.2	7.35	7.34	7.46
TDS(ppm)	1730	1560	820	299	1670	2670	3240	482	2390	2280
salinity(mg/l)	568	568	284	71	710	639	781	71	497	284
alkalinity(mg/l	190	180	190	90	190	340	230	180	400	480
hardness(mg/l	230	1100	610	160	600	520	860	270	700	350
sulpahte(ppm)	0.444	0.508	1.147	0.38	0.468	0.529	0.568	0.461	0.842	1.038
Ca(mg/l)	92	440	244	64	240	208	345	108	281	140
Mg(mg/l)	208	993	550	144	541	469	776	244	631	316
Na(ppm)	7	3.1	2	1.7	4.7	7.6	6.8	1.96	7.3	7.6
K(ppm)	4.3	3.7	3.5	3.2	2.6	2.9	1.68	1.61	1.34	1.38
Cr(ppm)	0.149	0.138	0.138	0.139	0.138	0.138	0.139	0.142	0.139	0.142
Fe(ppm)	0.232	0.232	0.232	0.222	0.226	0.343	0.222	0.235	0.248	0.232
nitrate(ppm)	82.3	92.2	103	12.5	20	83.4	255	20.4	209	133
fluoride(ppm)	1.14	0	0	0	0	1.15	0	0	0.45	0.942

RESULT AND DISCUSSION

In results are given district wise and there is variation between the parameters.

pH

Its value is under range in most of districts, but in districts like sikar (BS) churu (RS) and Alwar (RS) its value is 5.45, 3.05, and 5.41 which is beyond the permissible range prescribed by ISI (6.5-8.5) or WHO. We easily get understand that the water we are drinking in these districts are acidic nature and yet it cause cancer [because acidosis cause lack of cellular oxygenation and it is one of the responsible factor of cancer as stated by Dr. Otto Warburg in 1931]. Or it can affect mucous membrane

TDS

Total dissolved solid is define as total mobile charge ions including salt mineral or metal dissolved in water. In other way we say that TDS indicate that water is contaminant or not. According to Drinking water indian specification desirable limit of TDS is 500 mg/l, but in districts like Ajmer (BS) Jodhpur (BS) and (RS), Pali (BS) karauli (BS) Bharatpur (BS) TDS level is very low which states that may be essential minerals is lacking. There are some district where TDS is very high like as Marwar (RS) [which comes in the pali district] Hindaun (RS) and (BS). It is observed Hindaun village which comes in the karauli district is very much polluted because of do not use of deep bore.

Salinity

It is defined as total amount of solid material in gram present in one kg of sea water taken and it is expressed in parts per thousand. Most of the districts having salinity above the desirable limit [which is 250 mg/l] but in certain districts limits are below of required quantity, Name of the districts which come in the category of deficiency of salinity are Ajmer (RS) Pali (BS) Bharatpur (BS) karauli (BS) and Jodhpur (BS) and (RS). Salt is very much necessary for maintenance of proper sodium in body, about 40% of body's sodium is contained in bone it makes proper nerve conduction and maintain blood pressure in body.

Alkalinity

"Acid neutralising capacity is alkalinity". It is very much necessary in the areas where the chances of acidic nature water arise. As we know that desirable and permissible limit of alkalinity is 200 mg/l to 600 mg/l respectively. Above table we get to know that the areas which are low alkalinity are as Jodhpur, Ajmer Churu and pali.

CONCLUSION

Above parameters which described above from them mostly parameter is beyond of permissible range except, ferrous sulphate sodium and potassium. It is not necessary that the parameter must be within permissible limit its deficiency also create trouble. Hence from study we came to an conclusion that direct source of water is also contaminated. Most people used bus and train as their way to reach an destination and during journey they use railway station and bus stand tap water as their drinking water source. But it is very worst condition that parameters are not within and are not fulfilling desirable limit due which we suffer. So it is very much necessary to take precautionary measures as required to removal of parameters which is harmful for us. Remediation methodology should be carrying out as soon as possible by government because if water will remain contaminant in these sampling points then Million of people suffer from these.

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