SEASONAL VARIATION OF GROUNDWATER QUALITY IN BAKSAWALA VILLAGE (SANGANER TEHSIL) JAIPUR (RAJASTHAN)

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ABSTRACT: Background: The quality of good drinking quality is of basic importance to body science and man's continuity depends heavily on its achievement. Objective: This study is done to understand the seasonal variations in the physiochemical parameters of the groundwater of Baksawala village (Sanganer Tehsil) of Jaipur district, Rajasthan using statistical tools. Methodology: To carry out the research Groundwater samples were collected for pre monsoon, monsoon and post monsoon period of a year. Five samples were collected from Baksawala village and chemical analysis was conducted. With the help of one-way ANOVA test the difference between the five sites of Baksawala village based on the parameters was calculated. Findings: paper reveals that groundwater of these five sites shows seasonal variations in all fifteen parameters using statistical methods like paired t-test and Analysis of Variance (ANOVA) tests. Ground water of all sites is not suitable for drinking and industrial purposes, which will help the local government, take necessary action.

Keywords: Chemical Analysis, Water, ANOVA, Physicochemical parameters

INTRODUCTION

Water is a basic natural resource in the environment which supports life in all form.

Its major use in the country is to irrigate the field crops. Irrigation is basic necessity for sustaining high production of crop in arid and semi arid regions prone to water deficit. In the state of Rajasthan, where the surface water availability is very limited due to scanty and erratic rains, farmer depend on ground water reserves both for drinking and irrigation purposes. Apart from that farmers also use polluted water which contains virus and bacteria. This polluted water adversely affects the heath of human being and farm animals. Due to lack of water, farmers of south Jaipur growing vegetable crops with polluted water. The sewerage water of Jaipur city is discharged through south Jaipur and without filtration & purification it is used for irrigating vegetable crops. So the vegetable crop growing their also get polluted. Although plants are getting rich manure containing water supply which increases growth and production yet at the same time they stand exposure to the invasion of pathogenic fungi, nematodes, virus & bacteria causing fatal diseases. It also carry propagates of pathogens which get deposited in roots, stem leaves & fruits etc. These vegetable cause health hazards in animal & human populations therefore it is essential to access the amount of microbial contamination and its impact on human & farm animals. Heavy metals contamination has been recognized as a major environmental concern due to their pervasiveness and persistence. These heavy metals are not biodegradable; hence there is a need to develop such a remediation technique, which should be efficient, economical and rapidly deployable in a wide range of physical settings. Thus, it was thought to study ground water quality of rural areas of Sanganer Tehsil, Jaipur district, Rajasthan, India. Various samples of ground water were collected from three villages of sanganer Tehsil periodically at different type of monsoon and following pattern will followed for sample collection are in following ways: pre monsoon (June), monsoon (August), post monsoon (October), sampling will be done for 2 years and different water parameters will be examined .Water samples were collected in different glass bottles. A laboratory test program was developed to provide a basis for measuring the properties of water and to assess the values of all the parameters which would be used to analyze full-screen lateral trials.

MATERIALS AND METHODS

Study Area comprises of Baksawala village (Sanganer Tehsil) of Jaipur district, Rajasthan, India. Jaipur district, covering geographical area of 11,061.44 sq. km and extending between north latitudes $26^o25'$ and $27^o51'$ and east longitudes $74^o55'$ and $76^o15'$ forms east-central part of the Rajasthan State. According to Census 2011 information the location code or village code of Baksawala village is 080133. Baksawala village is located in Sanganer Tehsil of Jaipur district in Rajasthan, India. It is situated 3km away from sub-district headquarter Sanganer and 23km away from district headquarter Jaipur. As per 2009 stats, Kheri Gokulpura is the gram panchayat of Baksawala village. In present study various physical and chemical parameters of Baksawala village are analyzed statistically to predict seasonal impact on concentration of various parameters.

Collection of samples: Groundwater samples were collected for pre monsoon, monsoon and post monsoon period of a year from the Tube well and Hand pump of five different sites of Baksawala village. One sample were collected from each site and as per APHA-Standard Methods for Examination of Ground Water Samples analyses conducted and the mean value calculated. The mean values from each sampling site were recorded as the concentration/value for that particular month. The Five Samples were used to analyze impact of variation of season on all sixteen parameters.

RESULTS AND ANALYSIS

Table 1 (a) gives values obtained in the experiments done for water samples in different seasons and its comparison with BIS standards. It is evident from Table 1(a) In the post monsoon season all parameters except nitrate, alkalinity and fluoride concentration are within the permissible limits. Values of parameters analyzed in during monsoon are found to be slightly higher than pre-monsoon season. After monsoon the some values again goes slightly down.
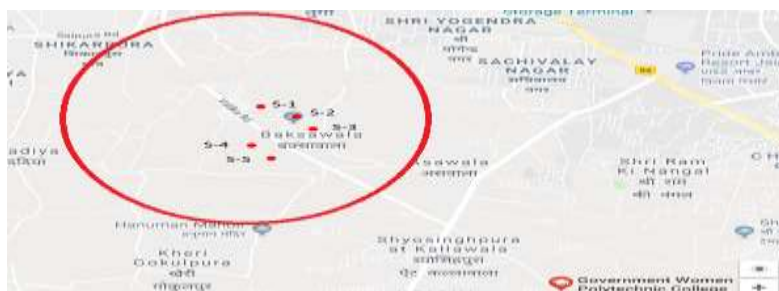
Figure 1: Sample location of baksawala village

Table 1(a). Experimental values of physico-chemical parameters of Baksawala

	Parameters	Premonsoon					monsoon					Postmonsoon				
		S.no, 1	S.no2	S.no, 3	S.no, 4	S.no, 5	S.no, 1	S.no, 2	S.no, 3	S.no, 4	S.no, 5	S.no, 1	S.no. 2	S.no, 3	S.no, 4	S.no, 5
1	pH	7.11	7.38	7.34	7.35	7.38	7.13	8	6.95	8.21	7.1	7	6.7	7	6.9	7.3
2	Hardness	340	236	390	370	348	580	232	620	200	400	372	248	212	240	168
3	Chloride	228.01	114.01	361.02	356.27	342.02	296.26	104.9	383.68	330.25	330.25	243.29	133.9	103.73	216.88	353.61
4	TDS	1033	751	1688	1735	1702	1324	736	1646	1557	1779	641	563	496	836	1000
5	Sulphate	47.22	10	110	140	171.43	120.78	9.44	124.67	87.78	97.78	37.56	21.75	31.5	53.12	84.38
6	Nitrate	96.59	72.98	28.04	118.27	91.57	173.37	82.72	200.54	106.19	160	103.48	68.69	77.61	108.04	99.78
7	Fluoride	0.5	0.38	1.46	1.14	1.51	0.25	0.34	0.19	1.54	0.84	0.2	0.36	0.45	0.81	2.09
8	Alkalinity	291	326	539	592	552	241.8	327.6	336.38	401.7	766.35	313.92	414.2	366.24	518.84	523.2
9	Elecrical conductivity	1589	1155	2597	2669	2619	2037	1132	2532	2396	2736	1224	1002	824	1452	1991
10	Salinity	0.8	0.6	1.3	1.4	1.3	1	0.6	1.3	1.2	1.4	0.8	0.7	0.4	1	1.3
11	Temperature	30	30	29	30	29	28	27	28	27	28	28	27	27	27	27
12	Turbidity	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1	BDL <.1
13	Phosphate	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1	Less then 0.1
14	Arsenic	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01	BDL <.01
15	E.coli	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

All the values are in mg/l except for pH

Table 1(b) . Permissible limite of physico-chemical parameters as per BIS standards

S. No	Parameters	Permissible limit as per BIS standards
1	*pH*	6.5-8.5
2	Total Hardness	600
3	TDS	2000
4	Fluoride	1.5
5	Nitrate	100
6	Sulphate	400
7	Calcium	200
8	Alkalinity	600
9	Magnesium	100
10	Chloride	1000

Table 2. Paired t-test results for difference in the physiochemical parameters of pre monsoon, monsoon and post monsoon of Baksawala

BAKSAWALA					
		Premonsoon-monsoon		monsoon-post monsoon	
S.N O.	Parameters	Value of T	Value of P	Value of T	Value of P
1	pH	-0.62667	0.274169	1.7952	0.055179
2	Hardness	-0.77084	0.231478	1.70829	0.062981
3	Chloride	-0.12922	0.450186	1.20727	0.130904
4	TDS	-0.09662	0.462701	3.40688	0.004633
5	Sulphate	0.21075	0.419176	1.80266	0.054555
6	Nitrate	-2.37464	0.02246	2.29356	0.02549
7	Fluoride	1.05219	0.161728	-0.35195	0.366985
8	Alkalinity	0.40779	0.347062	-0.12459	0.451961
9	Electrical conductivity	-0.09632	0.462818	2.4957	0.018595
10	Salinity	-0.09387	0.463762	1.2597	0.121641
11	Temperature	5.7735	0.000209	1.26491	0.120752

*Significant at 5% level

From the table we can clearly see that the calculated values of paired t-test for conductivity, TDS, nitrate and temperature are significantly higher than the tabulated value at 5% level of significance. This implies that null hypothesis is rejected i.e. there is a significant difference in the pre monsoon , monsoon and post monsoon values of groundwater parameters. Also it is evident from the table that the calculated values of paired t-test for pH, total hardness, chloride sulphate , alkalinity, salinity and fluoride are less than the tabulated value at 5% level of significance. This result in the acceptance of null hypothesis i.e. there is no significant changes in *pH, total hardness, chloride sulphate , alkalinity, salinity and fluoride* values before and after monsoon.

4. Conclusion

The study reveals that groundwater of all the sites is not suitable for drinking & industrial purposes. Technical suitability has been checked by comparing values with BIS Standards. Statistical suitability has been verified using statistical methods like paired t-test methods and ANOVA method. The t-test used for all parameters showed that the calculated t-values of many parameters especially TDS, nitrate and fluoride are more than the tabulated values resulting in rejection of null hypothesis which indicated that there is a significant difference between pre monsoon, monsoon and post monsoon values. High concentration of TDS, Alkalinity, fluoride and nitrate in all water samples is due to mixing of various types of salts in post monsoon groundwater samples through infiltration which leads to poor water quality. In addition, ANOVA method has shown that under consideration all the three sites have a significant difference in the concentration of all fifteen parameters. Hence the results and discussions confirm the chemical and statistical suitability of the ground water of all the five sites of Baksawala village (Sanganer tehsil).

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