International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.10 No.5, pp 166-172, 2017

Physico-Chemical Analysis of Ground Water of Difference Places in Jaipur City and its Defluoridation by using Marble Slurry Powder

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Abstract : The many number peoples are dependent on ground water for drinking purpose in rural areas andPotable safe water is absolutely essential and is the basic need of all human beings on the earth. The present study investigates are fluoride in the level of groundwater of various places are difference in jaipur city of Rajasthan state. The collecting of eight samples of different places in jaipur city from bore wells and hand pump. In the current research paper by employing SPANDS method, fluoride ion concentrations in water were determined spectrophotometrically at 570 nm. first and then marble slurry powder (MP) was used as adsorbents in defluoridation of water. In this paper, dose of adsorbents, contact time and concentration of fluoride ions will be discussed with their interdependence.
Keywords : Fluoride, marble slurry powderpowder, Analysis of study area.

Introduction

"Water is life's matter and matrix, mother and medium. There is no life without water".Potable safe water is absolutely essential and is the basic need of all human beings on the earth. Due to rapid industrialization and subsequent contamination of surface and ground water sources, water conservation and water quality management have now a day's assumed a very complex shape. In Rajasthan water is not only saline, but it also contains many dissolved substances, due to which water is not suitable for drinking. These substances have either the toxic effects on the consumer or have long terms indirect effects[1-4].

All the 33 districts of Rajasthan have been declared as fluorososis prone areas. The worst are- Nagaur, Jaipur, Sikar, Jodhpur, Barmer, Ajmer, Sirohi, Jhunjhunu, Churu, Bikaner, Ganganagar etc.[5,6].

Nitrate is also one of the most common groundwater contaminants in the Districts of Rajasthan have been reportedconcentration more than 45 mg/L[7].In Amer, Bassi, Chomu, JamwaRamgarh, Kotputali, Shahpura and Virat Nagar tehsils of Jaipur district there is the problem of high fluoride and nitrate concentrations in groundwater[8].The state has extreme climatic and geographical condition and it suffers both the problems of quantity and quality of water[9,10,11].

In the study area there are no major surface water sources, however; the main sources of drinking water are open wells, hand pumps and bore wells[12,13].

In Bassi Tehsil 84 villages are reported to have fluoride concentration more than 1.5 ppm, 78 villages are exhibiting nitrate concentration more than 45 ppm and 30 villages are having Electrical conductivity more than 3000 micromhos/cm[14,15]. All the samples were analyzed for the following Physico-chemical parameters;

pH, Total Alkalinity (TA), Total Hardness (TH), Calcium hardness (CaH), Magnesium hardness (MgH), Chloride, Nitrate, Fluoride, Total Dissolved Solid (TDS) and Electrical Conductivity (EC). The analysis of water samples were out carried in accordance to standard analytical methods[16,17].

Method and Materials

Materials:-

The apparatus were washed with nitric acid and distilled water before use. First, a stock solution of 100 mg/L was prepared by dissolving appropriate amount of sodium fluoride (NaF) in distilled water anddesiredconcentrations of solutions were prepared fromstock solution. Naturally occurring and abundantly available low cost material marble slurry powder was obtained from a local kiln.Themarble slurry powder was washed several times with distilled water and dried in oven at 105 ºC for 12 h. The dried material was sieved to obtain particles, of size 300 μm, for the present study.

3.2 Experimental Methodology

Adsorption methodwas conducted to study the effect of controlling parameters like contact time, adsorbent dosage of marble slurry powder. The experiment was conducted at room temperature. Fluoride concentration was estimated by SPADNS(Trisodium-4,5 Dihydroxy-3-(p-sulfophenylazo)-2,7-naphthalene disulfonic acid) method using a spectrophotometer.

Ground water samples collected from various placesofJaipur city was studied for defluoridation under the feasible optimized conditions to check the suitability of the marble slurry powder adsorbent under field conditions. The physico-chemical properties of ground water samples were determined before and after treatment by marble slurry powder.

Results and Discussion

On physico-chemical characterization of the water samples collected from various location. We observed interesting changes in the values of different parameter including pH, EC, TDS, total alkalinity, total hardness, chlorides ions and fluoride, after using marble slurry powder as an adsorbent. The values before treatment and after treatment are summarized in Table-I & 2

Comparison of pH of the sample before treatment and after treatment with marble slurry powder:Discussion: -pHdepends on H^+ ions concentration present in ground water sample and it is important indication of water quality. The pH is maximum in main Jagatpura site (9.4) and minimum at Bajaj nagar site (8).

Table-1 The values before treatment and after treatment are summarized in table:

S. no.	Name of location	pH		EC		TDS		Tatol Alkalinity	
		Before Treat.	After Treat.(MP)	Before Treat.	After Treat.(MP)	Before Treat.	After Treat.(MP)	Before Treat.	After Treat.(MP)
1	TebbabalaJagatpura	9.3	9.2	0.73	0.76	466	510	310	300
2	Airport	9.1	9.0	0.60	0.63	386	410	275	265
3	Main Jagatpura	9.4	9.2	0.62	0.64	398	423	315	305
4	Malviyanager	8.4	8.1	0.74	0.78	475	510	115	100
5	Sawaimansigh hospital	8.1	8.0	2.11	2.31	1373	1460	75	72
6	Taro Ki khoot	8.7	8.5	0.95	1.09	605	645	110	100
7	Lalkothi	8.3	8.2	0.58	0.61	310	340	80	77
8	Bajaj nagar	8.0	7.9	1.58	1.71	990	1096	60	53

Table-2 The values before treatment and after treatment are summarized in table:

S. no.	Name of location	Total Hardness		Chloride ion		Fluoride ion	
		Before Treat.	After Treat.(MP)	Before Treat.	After Treat.(MP)	Before Treat.	After Treat.(MP)
1	TebbabalaJagatpura	100	105	100	90	2.896	2.610
2	Airport	70	75	50	40	.498	.420
3	Main Jagatpura	90	95	40	30	.385	.315
4	Malviyanager	100	105	120	100	.478	.423
5	Sawaimansigh hospital	350	375	430	400	1.686	1.523
6	Taro Ki khoot	120	130	140	150	.367	.320
7	Lalkothi	70	75	100	110	.298	.252
8	Bajaj nagar	150	160	350	370	1.489	1.305

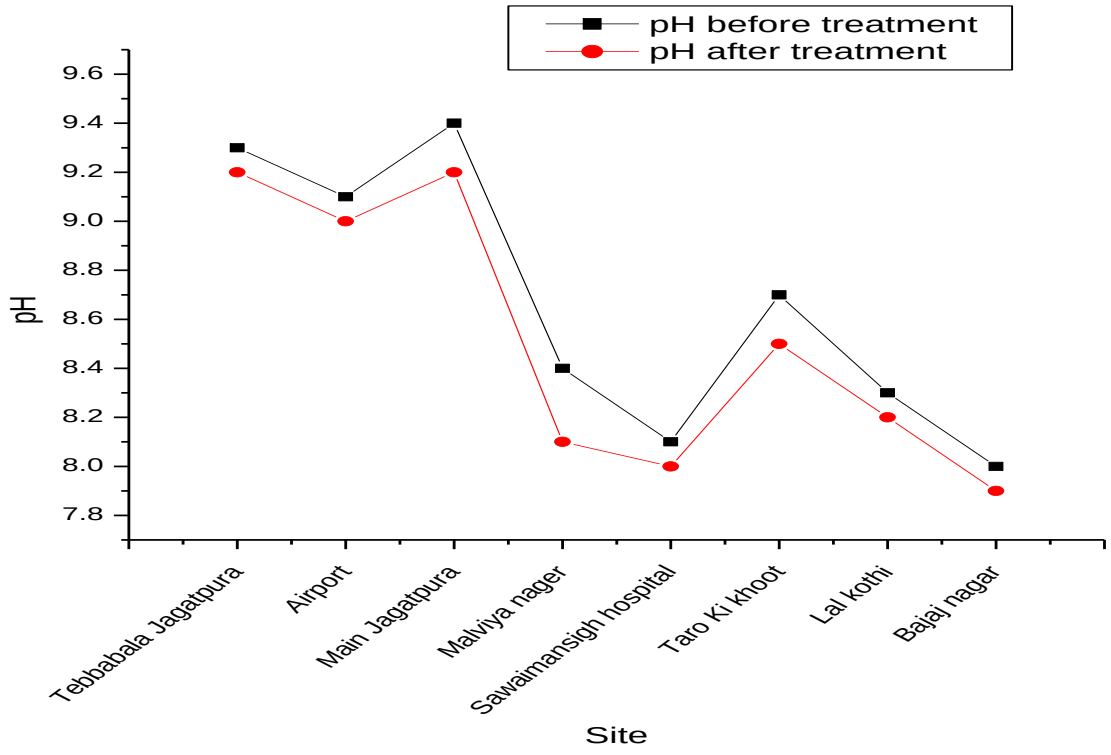

Fig.- 1: Comparison of pH of the sample before treatment and after treatment with marble slurry Powder

Comparison of electro conductivity (EC) present before treatment and after treatment with marbleslurrypowder: Discussion:-Electro conductivity dependsondissolvedion concentration and it is measured by the electro conductivity meter. The maximum electro conductivity is at the Sawaimansigh hospital (2.11mho^{-}) and lower level found at lalkhothi (0.58mho^{-}).

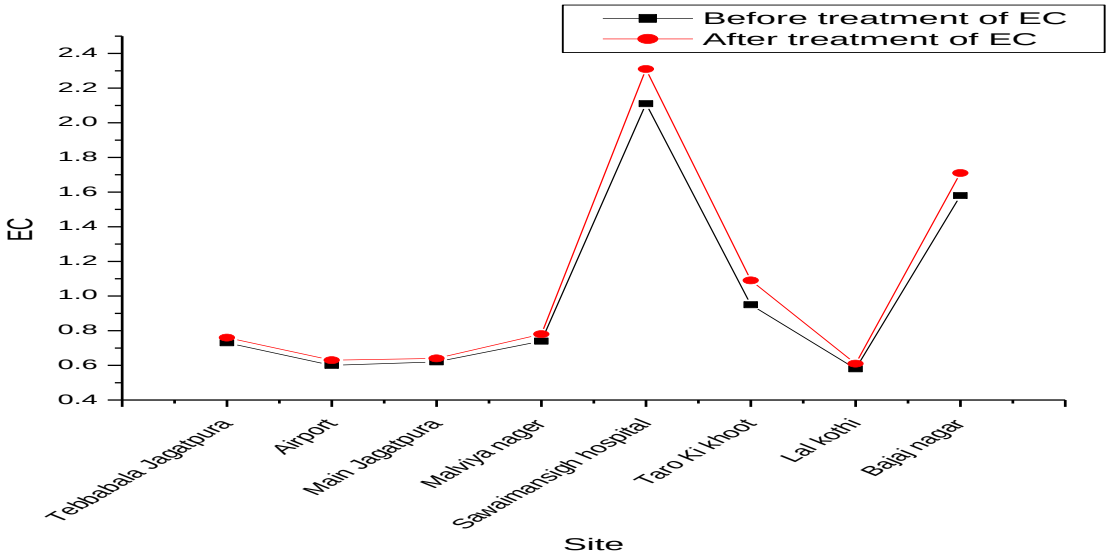

Fig.- 2: Comparison of total electric conductivity (EC) present before treatment and after treatment with marble slurry Powder

A comparison of total dissolves solid (TDS) present before treatment and after treatment with marble slurry powder: Discussion: Studies of total dissolve solid (TDS) concentration were analyzed by gravimetric method. It consist of HCO_3^-, SO_4^{-2} and Cl^- of calcium, sodium and magnesium ions as major part. It is found in maximum concentration at the Sawaimansigh hospital (1373ppm) and lower level found at lalkothi (310ppm).

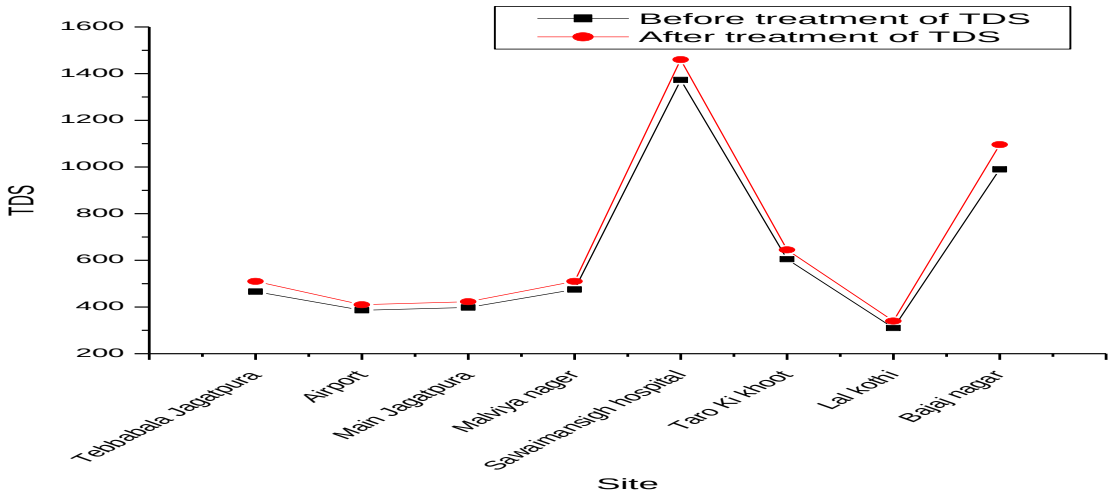

Fig.- 3: Comparison of total dissolve solid (TDS)present before treatment and after treatment with marble slurry Powder

A comparison of total alkalinity present ground water before treatment and after treatment with marble slurrypowder:Discussion: -The alkalinity of ground water sample was determined bytitration method and it depends on OH^- ions concentration. The alkalinity is found to be inmaximum at main Jagatpura site (310ppm) and lower level at Bajajnager site (60ppm).

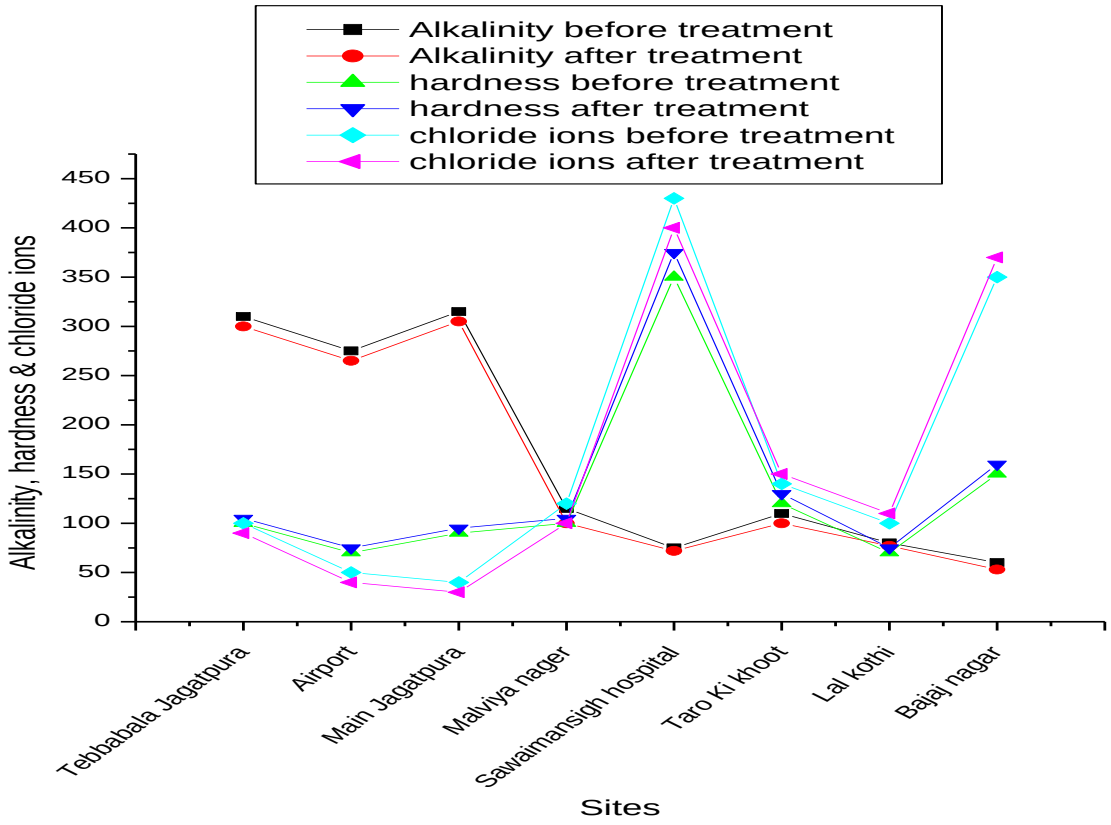

Fig.- 4: Comparison of total alkalinity, hardness & chlorides ions present before treatment and after treatment with marble slurry Powder

Comparison of total hardness present before treatment and after treatment with marble slurry powder:Discussion: -The total hardness is determined by EDTA method and it depends on carbonate, bicarbonate of calcium magnesium salt, chlorides sulphate and heavy metal. It is maximum level atsawaimansigh Hospital (350ppm) and lower level ofLalKothi (70ppm).

A comparison of chloride present before treatment and after treatment with marble slurry powder: Discussion: - Chloride ion concentration is determined by silver nitrate titration method. The chloride concentration range is from40 ppm to 430 ppm. The maximum chloride ions are present at the Sawaimansigh hospital site (430ppm) and lower level at the Main Jagatpura site (40ppm).

Comparison of fluoride present before treatment and after treatment with marble slurrypowder:Discussion: -Thestudies on the initial fluoride concentration were conducted by SPAND method using adsorbent dose of 2.0 g/100 ml, and contact time of 15 minutes. The fluoride is removed by adsorption method and comparison of fluoride in water samplebeforetreatment and after treatment with marble slurry powder. It is reported in table–1 and depicted in fig...The fluoride is found in maximum concentration at TebbabalaJagatpura (2.896ppm) and lower level found at lalkhothi (.298ppm).

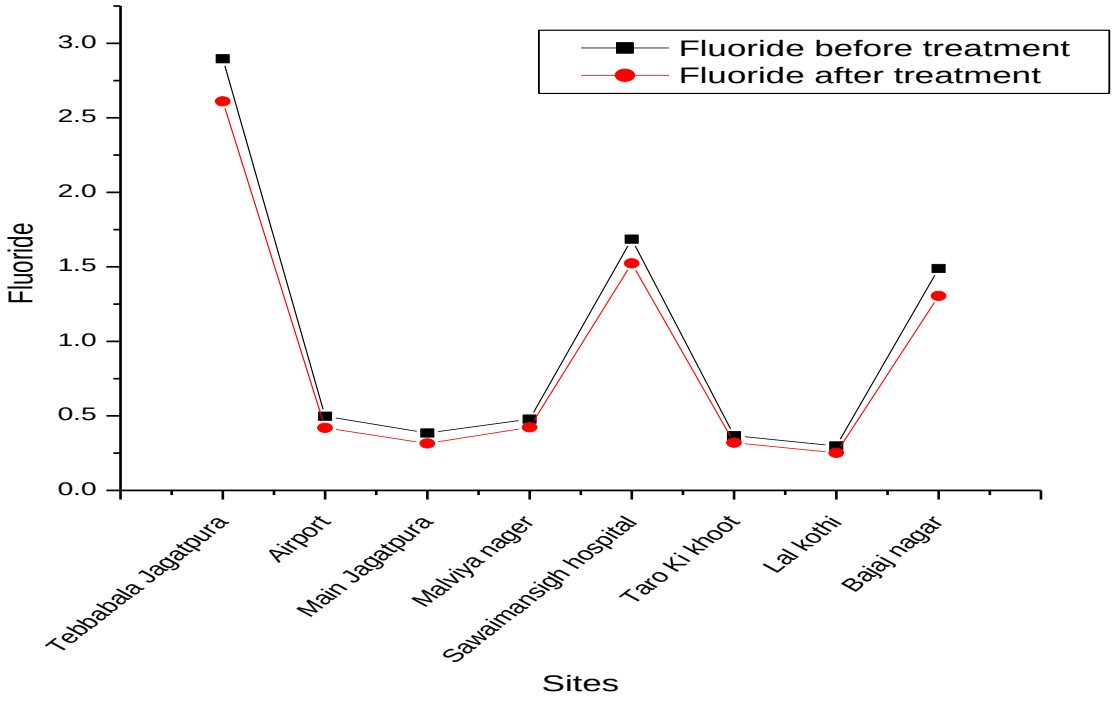

Fig.- 5: Comparison of fluoride present before treatment and after treatment with marble slurry Powder

Conclusion

In the present study, marble slurry powder was used as adsorbents for removal of fluoride from various ground water samples of different fluoride concentrations. The maximum fluoride is present in TabbabalaJagatpura and lower level of fluoride is Lalkothi sites. Fluorides are measured by SPANDS method. The main conclusions that can be drawn from the above study are given as: adsorption of fluoride on marble slurrypowder.It can be regenerated thermally and chemically. It can be explained on the basis of the chemical interaction of fluoride with the metal oxides, which makes it very suitable for use in ground water treatment. Presence of others ions in groundwater did not significantly affect the defluoridation process thereby indicating that marble slurry powderis selective adsorbent for fluoride. High concentration of fluoride may also cause harm to the ecosystem and vegetation.

Acknowledgement

Author (NK) thankfully acknowledge the scholarship given by President, JECRC University for his Ph.D. work.

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