

Hydrochemistry & quality assessment of ground water in Padampur tehsil area of Sri Ganganagar district, Rajasthan, India.

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Abstract

Hydro chemical analysis of ground water samples collected from various selected locations of Padampur tehsil area of Sri Ganganagar district during four seasons (pre-monsoon, post-monsoon, winter and spring) was taken as research work to analyze the level of hydro chemical parameters of contaminated groundwater of selected area, the samples were collected as per standard procedure from hand pumps used watering in bulk for drinking use, and analyzed to determine various hydro chemical parameters viz. pH, EC, TDS, TA, TH, Ca, Mg, Na, K, CO₃, HCO₃, F and DO, BOD, COD, Cl₂, F, NO₃, SO₄ and heavy metals in collected samples, by standard methods prescribed for the purpose. High concentration of hydrochemical parameters in ground water may be the reason of various water borne diseases. Hence this research work was under taken to aware about the facts to the public and responsible agencies to take pollution control measures in time at various essential levels.

Key words- Ground water, Ganganagar tehsil, Hydro chemical parameters.

Introduction

Water is known as foundation of all type of life.

Water is an vital natural resource for life of all humans, natural world on planet. All processes of life are connected directly or indirectly with water thus human beings cannot survive to a large extent without water, as water plays a innermost and significant role for every cell and organism in the human body to function appropriately. Water is accountable for each activity in individual body. In developing countries harmless and plenty drinking water supply is a fundamental issue in rural and in lots of urban areas¹.

In rural areas groundwater is a consistent and limited source of water. The most frequent sources of water for irrigation and different purposes are outside water and groundwater. Ground water and outside water are connected interiorly. The surface water is available in the form of oceans, streams, rivers, ponds and lakes on the surface of earth and the groundwater is available beneath the earth.

Groundwater is a fundamental source of water all over the world. Groundwater is extracted by a bore well or a tube well. Groundwater is a basic component of the water assets for domestic,

industries, irrigation or drinking purpose. Groundwater is polluted from waste dumping sites, animal waste, leaking of underground storage tanks, industrial chemical waste, by broad agricultural lands used pesticides and fertilizers. Polluted groundwater can be inappropriate for different purposes and its remediation is almost not possible or time-consuming and costly. It may be injurious for human health as well as environmental health.²

Groundwater is contaminated when it hold enough impurities to make it unhealthy for deliberate use. Contamination of groundwater may be natural or it may be human induced. Human doings affects the normal composition of groundwater. Groundwater pollution occurs owing to the presence of unnecessary constituent, and adulteration in the groundwater. Use of unhygienic groundwater causes health problems to people; thus it is important to test the behavior that distresses the quality and quantity of groundwater. Groundwater is usually used for drinking purpose in rural area³.

Material And Methods

The Study Area:

Sri Ganganagar district is situated in the northernmost part of Rajasthan State, positioned between 29.903839 Latitude and 73.877190 Longitude, being a plain region of Thar Desert land,

near International Pakistan border. It is surrounded by Ferozpur district of Punjab State and Hanumangarh and Bikaner district of Rajasthan State. It has 16 towns and 3018 villages. Out of its nine tehsils: Anupgarh, Gharsana, Karanpur, Padampur, Raisinghnagar, Sadulshahar, Ganganagar, Suratgarh and Sri Vijaynagar in this district, we have selected Padampur tehsil for this research work, as in the rural area of this tehsil, ground water is also widely used for drinking purpose.

Collection and analysis of water samples:

To analyze the parameters of contaminants in groundwater of selected area, ground water samples were collected from different four villages of this tehsil i.e. Sawantsar, Ghamurwali, Chanhanadham and Fakirwali, where the people use ground water in bulk for drinking purpose. Samples were collected in four seasons i.e. pre- monsoon, post-monsoon, winter and spring, throughout the year 2019-2020, for evaluation and characterization of their hydro chemical properties. All the collected ground water samples were analyzed by using standard methods mentioned in book “Standard methods for the examination of water and wastewater, 17th edition, 1989, which is prepared and published jointly by American public health Association (APHA)4, 5, and water pollution control federation (WPCF) and American water works association (AWWA). 6

Result And Discussions

The hydrochemistry and quality analysis of hydro chemical parameters of ground water samples of five villages of Padampur tehsil of Sri Gangbanger district for the year 2019-20 during four seasons (pre-monsoon, post-monsoon winter and spring) are shown in Table no - 1 and Table No. 2, heavy metals and of some other chemical parameters are shown in Table No - 3 and Table No-4

	29.725	ter	61	5	2	.3	9	8	
4		Spring	7.63	215	152	.983	118	116	45
5	Ghamurwali Longitude	Pre monsoon	7.69	1510	708	.983	120	140	120
6	73.775 Latitude	Post monsoon	7.52	1490	695	.978	125	135	122
7	26.676	Winter	7.65	1503	696	.983	121	138	119
8		Spring	7.68	1507	696	.983	119	136	121
9	Chana nadham	Pre monsoon	8.14	255	176	.329	129	160	48
10	Longi 73.626 Latitude	Post monsoon	8.09	247	173	.326	135	155	50
11	29.707	Winter	8.11	254	175	.327	131	158	47
12		Spring	8.11	254	175	.328	130	156	49
13	Fakirwali Longitude	Pre Monsoon	7.35	314	214	.679	166	170	52
14	73.684 Latitude	Post monsoon	7.32	300	207	.674	172	165	54
15	29.619	Winter	7.32	308	211	.679	168	168	51
16		Spring	7.35	308	211	.679	167	166	53
	Min. Concentration		7.32	210	148	.674	117	115	43
	Max. concentration		8.14	1510	708	.983	172	170	122
	Average concentration		7.67	602	322	153	136.1	145	68.2

Table-1 Hydrochemistry parameters results of ground water of Padampur Tehsil

S. N.	Location	Season	pH	EC	TD	TA	HC	TH	Ca ²⁺
1	Sawant Sar Longi	Pre monsoon	7.64	230	155	98.3	117	120	43
2	73.596 Latitude	Post monsoon	7.41	210	148	97.8	123	115	46
3	29.725	Win	7.21	215	1598	98	111	111	44

Table-2 Hydrochemistry parameters results of ground water of Padampur Tehsil

S. N.	Location	Season	Mg ²⁺	Na ⁺	K ⁺	Cl ⁻	SO ₄ ²⁻	NO ₃ ⁻	F ⁻
1	Sawant Sar Longi	Pre Monsoon	4.2	29	5.8	28	48	7	0.24
2	73.596 Latitude	Post Monsoon	7.2	31	5.75	30	51	9	0.25

3		Win ter	5.2	28	5.78	27	49	7.6	0.26	
4		Spri ng	6.2	30	5.79	29	50	8	0.23	
5	Ghamu rwali Longi 73.775 Latit.26.676	Pre Mon soon	59.7	87	4.8	42.6	15.8	8	0.41	
6		Post Mon soon	62.7	90	4.75	42.8	16.0	10	0.42	
7		Win ter	60.7	88	4.78	42.5	15.7	8	0.43	
8		Spri ng	61.7	89	4.79	42.7	15.9	9	0.4	
9		Chana nadha m	Pre Mon soon	11.7	20.5	5.9	35.6	53	4	0.29
10		Longi 73.626 Latit 29.707	Post Mon soon	14.7	23.5	5.85	37.6	55	7	0.36
11		Win ter	12.7	21.5	5.88	34.6	52	5	0.31	
12		Spri ng	13.7	22.5	5.89	36.6	54	6	0.28	
13	Fakirw ali Longi 73.684 Latit 29.619	Pre Mon soon	11.7	25	7.4	27	50	7	1.57	
14		Post Mon soon	14.7	27	7.35	30	52	9	1.58	
15		Win ter	12.7	24	7.38	28	49	6	1.57	
16		Spri ng	13.7	26	7.39	29	51	8	1.56	
		Min. Concentratio		4.2	20.5	4.75	27.6	48	4	0.23
		Max. concentration		62.7	90	7.4	42.8	16.0	10	1.58
	Average concentration		24.4	42.9	5.96	14.0	81.1	7.37	0.66	
			5	3	8	6	4	8	5	

2	Ghamu rwali	6.2	2	5.2	0.1	N	N	0.1	N	0.0
3	Chanan adham	5.1	1.5	6	0.1	N	N	N	N	N
4	Fakirw ali	6.1	2	3.6	0.0	N	N	N	0.0	N
	Average	6.03	2.3	4.55	0.09	N	0.0	0.0	0.13	0.05
	Minimum	5.1	1.5	3.4	0.06	N	0.0	0.0	0.1	0.01
	Maximum	6.7	3.7	6	0.11	N	0.0	0.0	0.15	0.09

Table-4 Hydrochemistry parameters results of ground water of Padampur Tehsil

S. No.	Location	Data Interpretation					
		A I	L SI	% Na	S AR	R SC	E SP
1	Sawant Sar Longi.73.596 Lati. 29.725	1.3	0.7	59.1	4.44	2.04	5.06
2	Ghamurwali Longi. 73.775 Lati. 26.676	1.2	0.2	58.2	4.14	3.13	4.66
3	Chananadham Long. 73.626 Lati. 29.707	1.2	0.6	62.6	4.76	3.49	5.47
4	Fakirwali Longi. 73.684 Lati. 29.619	1.2	0.7	68	5.48	4.1	6.4
	Average concentration	1.28	0.6	62	4.71	3.19	5.4
	Minimum concentratrion	1.2	0.2	58	4.14	2.04	4.66
	Maximum concentratrion	1.3	0.7	68	5.48	4.1	6.4

Table-3 Hydrochemistry parameters results of ground water of Padampur Tehsil

S. No.	Locatio n	Parameters			Trace Heavy Metal					
		D O	B O D	C O D	F e	C d	C u	Z n	M n	P b
1	Sanwat Sar	6.7	3.7	3.4	0.08	N	0.0	0.0	N	0.0

As per hydro chemical data analysis results of Padampur tehsil water samples, shown in above Table No. 1 to 4, parameters TDS (25%), Chloride (75%), Sulphate (100%), TH (75%), CA (75%), Mg (75%), NO₃ (100%), F (25%) and EC (75%) were found within acceptable limit. As well as TDS (75%), Chloride (25%), TH (25%), CA (25%), Mg25% and F (25%) were found withiu permissible limit. Only

the concentration of F (25%) parameter was found beyond the prescribed limit.

Conclusion

As per IS standards 10500 maximum concentration of fluoride in drinking water is 1.50 mg/L, only the concentration of Fluoride (25%) parameter was found beyond the prescribed limit in the ground water samples collected and analyzed from Padampur tehsil. Drinking water having low concentrations in Fluoride can prevent tooth decay, but on the other hand higher concentrations of Fluoride may be harmful to human health. It may create crippling skeletal fluorosis. Fluoride is found as natural element of rocks. In normal water the major sources of fluoride are Fluorites (CaF_2), Fluorapatite, Cryolite (Na_2AlF_6). Food consumed in the diet is also considered as main source of fluoride. High fluoride cluster is originate in Tea Fluoride can strengthen and re-mineralize the teeth damaged enamel, can make it more resistant to decay. This is the reason to add fluoride to public drinking water, toothpaste and mouthwash. Grapes, Raisins, Spinach, black tea, potatoes are natural sources of Fluoride.

Recommendations and Suggestions:

Measures to be adopted to control the Ground water contamination:-

1. The sources creating pollution should be managed properly. Landfills should be designed properly with the use of clay and leachates. Maintenance should be done regularly. Keep landfills locations far from the groundwater areas.
2. Dumping of any Harmful waste should never be dumped in the landfills area.
3. Pretreated thr ground water to less health threats.
4. Government and non-government Organization of People Awareness Campaigns by Government organizations and NGQs.
5. Being a main source of groundwater contamination, fertilizers and pesticides use should be monitored regularly.

References

- 1 Aravinda H B, Correlation coefficient of some physic-chemical parameters of river Tungabhadra, Karnataka, Pollution research, 17(4),371- 375, 1991.
- 2 Chatterjee R, Gourab T and Paul S, Groundwater quality assessment of Dhanbad district, Jharkhand, India, Bulletin of Engineering Geology and Environment, 69(1), 137-141, (2009).
- 3 Chhatwal Gurdeep Raj, Advanced Physical Chemistry, Goel Publishing house, Meerut (2002).
- 4 Agrawal V and Jagetia M, Hydrogeo-chemical assessment of ground water quality in Udaipur City, Rajasthan, India, 151-154, 1997.
- 5 Almasri M N and Kaluarachchi J J, Assessment and management of long-term nitrate pollution of ground water in agriculture-dominated watersheds. J. of Hydrology, 295, 225-245, 2004.
- 6 Amaaliya N K and Kumar S P, Carried out ground water quality status by water quality index method at Kanyakumari, (INDIA), 2(9), 76-82,2013