

# Physico- Chemical Characterization of Ground Water of Chirawa, Buhana and Surajgarh Tehsil of Jhunjhunu District. Rajasthan (With Special Reference to Fluoride)

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**Abstract-** Physico- chemical characterization of ground water of Chirawa, Buhana and Surajgarh tehsil of Jhunjhunu district have been studied. Water samples from the ground water of villages, colonies, school, hospitals and railway station were collected and analyzed for physico- chemical parameters like ammonia, alkalinity, pH, electrical conductivity, turbidity, TDS, Total hardness, and concentration of ions like chloride, fluoride, nitrate, sulphate, sodium, potassium, phosphorus, some heavy metal like as Mn and Fe. It has been observed that all parameters were found within desirable limit compared to BIS, but fluoride, potassium, and sodium values are higher compared to WHO. The interesting fact that phosphorus, iron and manganese were not found in any ground water samples. Only fluoride, potassium and sodium are making ground water unfit for drinking.

**Index Terms-** Physico-chemical, Ground water, Fluoride.

## I. INTRODUCTION

Chirawa, Buhana and Surajgarh tehsils are a municipal towns in Jhunjhunu district of Shekhawati region in Rajasthan state of India. These tehsils are located in North –East direction of Jhunjhunu district. Geographical areas of these tehsils are 1923.27 sq.km. out of Jhunjhunu district. These tehsils have dry climate with hot summer. In summer, sand storms are a characteristics features of these tehsils. The temperature varies from 1° to 48°C while the mean temperature is 26°C. Chirawa and Surajgarh tehsils have plain and sandy soil, therefore agriculture and irrigational dependence on ground water. North-East region of Buhana tehsil having agricultural and irrigational depends on ground water. The conclusions of these tehsils are that all activity of human beings depends on ground water. But the major areas of these tehsils ground water are affected by fluoride and others parameters. These polluted ground water used in different ways of human. Thus, the human population suffered from many water borne disease like as fluorosis, arthritis, dental carries in children and knee problems in adults and men and women. Hence the author has chosen these areas for this research.

## II. EXPERIMENTAL:

In the present study, Chirawa, Buhana and Surajgarh tehsil of Jhunjhunu district were selected. 42 water samples were collected from different location of these tehsil. These samples were collected from tube well, Hand pumps and water tanks. The samples were collected in wide mouth plastics bottles. Before collection of water samples, bottles were washed with water and detergent after that soaked in 1% Nitric acid for 24 hours and then again washed with clean water. After collecting samples were analyzed by the following methods.

## III. METHODS

1. Electrical conductance by Conductometric method
2. Fluoride by Ion-selective method
3. Sulphate by Spectrophotometric method
4. Phosphorus by Vanadomolybdophosphoric acid method
5. Ammonia by ammonia selective method
6. Fe and Mn by AAS and ICP method
7. Nitrate by UV spectrophotometric method
8. Chloride by argentometric method
9. pH by pH metric method
10. TDS by titration method
11. Turbidity by Nephlo-meter
12. Total hardness by titration method
13. Sodium by Flame photo meter
14. Potassium by Flame photo meter
15. Total alkalinity by Titration method

## IV. RESULTS AND DISCUSSION

The results obtained for CHIRAWA, BUHANA and SURAJGARH tehsil areas are reported in Table -1. Forty two water samples were analyzed for following parameters-EC, Fluoride, Sulphate, Phosphorus, Ammonia, Fe and Mn, Nitrate, Chloride, pH, TDS, Turbidity, TH, Sodium and Potassium and Total alkalinity.

Table-1: Physico-chemical characterization of the ground water quality parameters for Chirawa, Buhana and Surajgarh tehsil of Jhunjhunu district, Rajasthan

Samples	EC	F <sup>-1</sup>	SO4 <sup>-2</sup>	P	NH <sub>3</sub>	Fe	Mn	NO3 <sup>-1</sup>	Cl <sup>-1</sup>	pH	TDS	Turbidity	TH	Na	K	TA
S1	568	0.7	28.5	ND	<0.2	ND	ND	4.8	152	7.61	426	<1.0	120	128	132	296
S2	616	0.8	29.6	ND	<0.2	ND	ND	4.9	160	7.63	462	<1.0	126	132	120	286
S3	605	0.9	32.2	ND	<0.2	ND	ND	5.1	148	7.65	454	<1.0	122	124	140	280
S4	580	0.8	31.2	ND	<0.2	ND	ND	5.3	156	7.70	435	<1.0	128	134	140	286
S5	624	0.9	32.4	ND	<0.2	ND	ND	4.9	160	7.61	468	<1.0	148	134	130	290
S6	680	0.8	30.6	ND	<0.2	ND	ND	5.5	148	7.63	510	<1.0	168	148	152	300
S7	710	1.0	33.5	ND	<0.2	ND	ND	5.2	160	7.65	532	<1.0	148	150	140	290
S8	596	0.8	35.6	ND	<0.2	ND	ND	5.0	150	7.75	450	<1.0	142	152	155	302
S9	624	0.9	29.8	ND	<0.2	ND	ND	5.2	162	7.61	468	<1.0	158	148	136	290
S10	590	0.7	28.5	ND	<0.2	ND	ND	4.9	152	7.61	442	<1.0	138	160	158	278
S11	620	0.9	30.5	ND	<0.2	ND	ND	5.3	156	7.68	465	<1.0	160	120	126	194
S12	640	0.8	30.5	ND	<0.2	ND	ND	5.3	168	7.70	480	<1.0	180	126	116	225
S13	660	0.9	30.5	ND	<0.2	ND	ND	5.3	156	7.68	465	<1.0	166	126	132	202
S14	702	1.0	35.6	ND	<0.2	ND	ND	5.5	162	7.68	520	<1.0	180	145	126	190
S15	710	0.8	31.5	ND	<0.2	ND	ND	4.5	160	7.80	530	<1.0	166	142	136	190
S16	670	0.7	39.8	ND	<0.2	ND	ND	5.3	156	7.68	510	<1.0	152	124	105	236
S17	720	1.2	32.6	ND	<0.2	ND	ND	5.3	68	7.68	540	<1.0	196	116	100	230
S18	720	1.2	33.8	ND	<0.2	ND	ND	5.3	168	7.68	580	<1.0	210	126	105	210
S19	620	0.9	30.5	ND	<0.2	ND	ND	5.3	156	7.68	465	<1.0	160	117	105	212
S20	690	0.9	30.5	ND	<0.2	ND	ND	5.3	186	7.68	522	<1.0	240	107	91	212
S21	710	1.2	30.5	ND	<0.2	ND	ND	5.6	192	7.68	532	<1.0	232	112	95	220
S22	710	0.9	36.5	ND	<0.2	ND	ND	5.3	186	7.80	540	<1.0	226	126	98	226
S23	740	0.8	38.4	ND	<0.2	ND	ND	6.2	196	7.71	512	<1.0	252	112	92	236
S24	896	0.9	30.5	ND	<0.2	ND	ND	6.2	360	7.68	692	<1.0	264	142	120	280

S25	912	1.1	39.6	ND	<0.2	N D	ND	6.5	400	7.90	726	<1.0	270	170	152	320
S26	1013	1.3	42.5	ND	<0.2	N D	ND	5.8	426	7.68	760	<1.0	286	176	148	326
S27	1026	1.2	44.8	ND	<0.2	N D	ND	5.8	442	7.68	780	<1.0	290	180	160	340
S28	1060	1.3	50.1	ND	<0.2	N D	ND	6.9	460	7.70	800	<1.0	286	180	158	326
S29	1216	1.3	55.9	ND	<0.2	N D	ND	6.8	460	7.68	912	<1.0	290	186	170	380
S30	1180	1.3	58.8	ND	<0.2	N D	ND	6.9	486	7.68	926	<1.0	296	186	170	380
S31	1060	1.3	49.8	ND	<0.2	N D	ND	6.3	390	7.72	856	<1.0	280	186	170	390
S32	1048	1.4	53.9	ND	<0.2	N D	ND	5.9	460	7.68	786	<1.0	270	176	146	342
S33	1068	1.2	48.9	ND	<0.2	N D	ND	6.3	420	7.73	801	<1.0	276	168	148	350
S34	980	1.1	53.6	ND	<0.2	N D	ND	6.4	490	7.68	842	<1.0	290	162	142	330
S35	980	1.2	48.7	ND	<0.2	N D	ND	6.3	420	7.68	780	<1.0	276	182	152	296
S36	960	1.3	45.9	ND	<0.2	N D	ND	6.8	412	7.72	720	<1.0	226	168	148	290
S37	940	1.2	48.7	ND	<0.2	N D	ND	6.3	326	7.70	705	<1.0	186	152	130	260
S38	962	1.2	43.9	ND	<0.2	N D	ND	6.4	302	7.68	720	<1.0	190	162	126	268
S39	920	1.3	49.6	ND	<0.2	N D	ND	6.8	296	7.71	690	<1.0	142	148	152	268
S40	920	1.3	50.9	ND	<0.2	N D	ND	6.8	268	7.70	690	<1.0	180	152	148	275
S41	912	1.3	45.2	ND	<0.2	N D	ND	7.1	252	7.52	684	<1.0	140	152	160	290
S42	896	1.2	48.6	ND	<0.2	N D	ND	7.4	242	7.46	672	<1.0	134	148	152	276

**Note: ND Stand for Non Detectable**

**EC-**In the present study, E.C. of the collected was lying in the range of 568 to1216 Microsimens/cm. The permissible limit for EC is 2100ms/cm. The analysis shows that all water samples have EC, within permissible limits.

**Fluoride-** In the present investigation, fluoride should have concentration between 0.7to 1.4 mg/liter and within this limit, it has no effect on the health of humans. High range of fluoride is responsible for dental carries in children and fluorosis in adults.

**Sulphate-**The sulphate range of ISI standards for drinking water is 200 to 400 mg/l. but all water samples sulphate range lying between 28.5 to 58.8mg/l. in drinking water. The analysis shows that the drinking water is safe.

**Phosphorus-**Phosphorus was not detectable in all 42 water samples.

**Ammonia-** The permissible limit of ammonia in potable ground water is maximum 0.5 mg/l. according to ISI. All drinking water samples have ammonia range is below 0.2 mg/l. It can be

said that the ground water under investigated area was found to be potable and desirable limits.

**Iron and Manganese-**The permissible limit of iron in potable ground water is 0.3 mg/l. as per Indian standards, but any water samples not have iron. The permissible limit of manganese in potable ground water is 0.1 to 0.3 mg/l. As per Indian standards but manganese is not detectable in ground water.

**Nitrate-**The nitrate concentration in the studied area varied from 4.5 to 7.4 mg/l. The maximum permissible limit is 4.8 to 45 mg/L.(ISI).The analysis shows that nitrate values in drinking water in desirable limits.

**Chloride-** In the present research investigation, the chloride concentration was observed in between 68 to 490 mg/L.As per ISI standards, the highest desirable limit of chloride for drinking water is kept at250 mg/l. and maximum permissible limit is 1000mg/l.

**pH Value-**The pH range of 6.5 to 8.5 is normally acceptable. All the 42 samples were found in the pH range 7.46 to 7.90. On

the basis of pH, it can be said that the ground water under investigated area was found to be potable and desirable limits.

**TDS-** For potable drinking water, the desirable concentration of TDS is less than 500mg/l. and maximum allowable limit is 2000mg/l. If the TDS value exceeds 2000mg/l. definite laxative effects are observed in those not accustomed to such salinity. It was observed that all samples are in permissible limits.

**Turbidity-**For potable drinking water, the desirable limit of turbidity is less than 1NTU and maximum allowable limit is 5NTU. If the turbidity value exceeds 1NTU, then the water is not potable for humans. Turbidity has no health effects, but can interfere with disinfection and provide a medium for microbial growth. Turbidity may indicate the presence of disease-causing organisms. These organisms include bacteria, viruses and parasites that can cause symptoms such as nausea, cramps, diarrhea and associated headaches. Investigated report shows that all 42 water samples are safe for drinking because the range of turbidity is less than 1NTU.

**Total Hardness-** As per ISI standards, water range for hardness is 200 to 600mg/l. The investigated report shows that all samples of ground water were found in the range of 120 to 296 mg/l. The hardness of water is due to the presence of alkaline earths such as calcium and magnesium Higher values of hardness is responsible for incrustation and scaling in pipelines.

**Sodium and Potassium-**Sodium and potassium ions provide opportunity to other negatively charged radicals to bind them. So these sampling sites are also rich in such chemical species. All water samples shows that the range of sodium 107 to 186mg/l. and potassium range in water samples are varies 91to 170mg/l.

**Total alkalinity-**The desirable limit for total alkalinity is 200 to 600mg/l. as per ISI standards. The values of water samples varies from 190 to 390 mg/l. In ground water, most of the alkalinity is caused due to carbonates and bicarbonates.

## V. CONCLUSION

It was a sample study of the ground water quality of Chirawa, Buhana and Surajgarh tehsil of Jhunjhunu district, Rajasthan. The interesting fact that phosphorus, iron and manganese were not found in any ground water samples. Only Fluoride, Potassium and Sodium are making ground water unfit for drinking as per WHO standards.

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