

## Quality Status of Potable Water of Tehsil-Sanganer, District-Jaipur, Rajasthan.



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**Abstract :** Drinking water quality of 17 villages of Sanganer Tehsil, Jaipur District, Rajasthan was analyzed to identify the nature of potability of water. The drinking water samples were collected in clean polyethylene one-liter cans and subjected for analysis in the laboratory. The parameters studied were pH, electrical conductivity (EC), fluoride (F), chloride (Cl), total dissolved solids (TDS), Ca and Mg hardness and total hardness (TH). The results revealed that the values of pH were found to be ranging between 6.39-8.34, EC ranged from 0.48-0.73 mmhos/cm and chloride content differed from 202.46-648.60 mg/l and total hardness varied from 413-1032 mg/l. The most important parameter fluoride was found to be 2.17-10.14 ppm, which is more than the permissible limit in all the samples studied. TDS varied from 82-429 mg/l. The data suggests that the drinking water of seventeen villages of Sanganer Tehsil contain high fluoride concentration, which leads to dreaded disease called fluorosis; hence drinking water is not potable.

**Key words :** Water quality, drinking water, electrical conductivity, fluoride, total dissolved solids, fluorosis.

### Introduction :

Quality of water is an important factor in development and use of ground water as resources. The potable water should be free from pathogenic agents and chemical constituents, pleasant to taste and usable for domestic purposes. The ground water is characterized by multiple quality problems (Gupta *et al.*, 2004). Many hazardous pollutants viz., coloured dyes, heavy metals, nitrates and fluoride pollute it. The water is a universal solvent, which contain many dissolved substances. The preliminary study carried out from this laboratory indicates that Sanganer region contains high fluoride in ground water (Sharma and Sharma, 2001). The problem of fluoride is worldwide phenomenon. Its occurrence in India is endemic in many states especially in Rajasthan and Andhra Pradesh (Susheela, 2001). The problem of high fluoride content in drinking water has become a serious environmental issue in the field of water quality management and human

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health (PHED, 2001). Fluorine is universally present in varying amount in soil, water, atmosphere, vegetation and animal tissues. Fluorine incidence in ground water is mainly a natural phenomenon, influenced basically by local, regional, geological settings and hydrological conditions (Sharma, 2003). In the light of above data, the present investigation has been undertaken to analyze the quality of potable water of villages of Sanganer Tehsil.

### **Materials and Methods :**

Sanganer, the Tehsil of Jaipur District, is attached with the main city of Jaipur. It lies between 26<sup>0</sup>49' to 26<sup>0</sup>51' latitude and 75<sup>0</sup>46' to 75<sup>0</sup>51' longitudes. Total area of the Tehsil is about 635.5 sq. km. There are different sources of drinking water viz., hand pumps, tube wells, open wells, PHED supply etc. 17 villages were selected for sampling of drinking water and these villages are-**Rampura, Vatika, Badvo ki Dhani, Chak Vatika, Madanpura, Teelabas, Dalala bas, Mohanpura, Kokabas, Lilia ka bas, Chatrapura, Shukhia, Ashawala, Shri Rampura, Chak Saliz Rampura, Mansa bas and Chak Karol**. Total 85 samples were collected from the study area in clean polyethylene one-liter cans and subjected for analysis. The samples were analyzed for pH, EC, TDS, fluoride, chloride, Ca-H, Mg-H and total hardness by following standard techniques (APHA, AWWA and WPCF, 1976).

### **Results and Discussion :**

The data revealed that pH ranged from 6.39 ± 0.26 to 8.34 ± 0.09. The minimum pH was observed in Rampura village and maximum pH was detected in Chak Karol village. pH is the negative exponent of H<sup>+</sup> concentration. According to WHO (1992) standards, best and ideal pH value for human consumption is 7.0, but it may vary from 6.9-9.2. Thus, all the samples tested were slightly alkaline; only one sample is acidic *i.e.* from Rampura village. The pH of all samples was within limit (Table 1).

The concentration of chloride varied between 193.02 ± 12.50 to 648.60 ± 59.16 mg/l. The minimum value was observed in Chatrapura village and maximum concentration in Shukhia village. However, according

to WHO (1984) the permissible limit for chloride is 200-600 ppm, which indicate that drinking water of Sanganer Tehsil contained chloride concentration within permissible limit except for Shukhia village wherein the chloride concentration is higher than the permissible limit. (Table 1).

EC is the capacity of water to carry ions, so it depends on the presence of ions and their concentration. Maximum and minimum values of EC were recorded in Mansa bas village i.e.  $0.78 \pm 0.02$  mmhos/cm. and Ashawala village i.e.  $0.48 \pm 0.03$  mmhos/cm. respectively. Thus variation in EC was observed in all the samples. EC signifies the amount of total dissolved salts, which indicates inorganic pollution of water (Table 1). According to WHO, the maximum acceptable limit of TDS in ground water for domestic purpose is 500 ppm. Here TDS found to be varied minimum  $82.00 \pm 1.11$  mg/l from Ashawala village and maximum  $429.26 \pm 7.70$  from Chak Karol village means all the values were within permissible limit (Table-1). A positive correlation was observed in EC and TDS. The present investigations were in agreement with the results of the survey conducted by Gupta *et al.* (1994).

In ground water hardness is mainly due to carbonates, bicarbonates, sulphates, chloride of Ca and Mg. Data revealed that the values of hardness ranged between  $413 \pm 18.22$  to  $1032 \pm 124.62$  mg/l from Chak Karol and Rampura village respectively, while the permissible limit of total hardness is 100-500 mg/l. Thus all the samples have TH more than the permissible limit except in Chak Karol village where it was within limit (Table 1). Minimum concentration of Ca-H was recorded in Kokabas village i.e.  $33.92 \pm 2.85$  mg/l and maximum in Chak Vatika village i.e.  $83.24 \pm 7.16$  mg/l (Table 1). Thus calcium content of all the samples was found to be below the permissible limit (75-200 mg/l) except two villages, Chak Vatika and Rampura, where it was within limit. The Magnesium concentration of all water samples was found to be more than the optimum range (30-150 mg/l) because of less calcium content. Maximum value of Mg-H was observed in Vatika village i.e.  $959.68 \pm 22.22$  mg/l and minimum in Chak Karol village i.e.  $376.24 \pm 32$  mg/l (Table 1). TH showed a negative correlation with fluoride and pH. These results were also in corresponds with the findings of Trivedi (1988).

**TABLE 1 : pH, Fluoride, Chloride, Total Dissolved Solids, Ca-H, Mg-H, total hardness and E.C of water samples.**

Village	pH (H <sup>+</sup> ion conc.)	F (mg/l)	Cl (mg/l)	TDS (mg/l)	Ca-H (mg/l)	Mg-H (mg/l)	TH (mg/l)	EC (m mhos/cm)
Ashawala	7.61 ± 0.07	6.20 ± 0.09	221.17 ± 17.98	<b>82.00</b> ± <b>1.11</b>	50.47 ± 4.02	664.64 ± 81.34	715.11 ± 32.98	<b>0.48</b> ± <b>0.03</b>
Badvo ki dhani	7.02 ± 0.05	3.30 ± 0.08	305.20 ± 11.72	104.75 ± 1.12	61.91 ± 3.32	958.73 ± 114.34	1020.64 ± 37.39	0.63 ± 0.01
Chak Saliz Rampura	7.91 ± 0.05	7.16 ± 0.04	202.80 ± 12.81	265.15 ± 5.49	63.18 ± 7.20	569.42 ± 36.82	636.60 ± 32.52	0.55 ± 0.01
Chak Vatika	7.1 ± 0.01	3.36 ± 0.04	200.00 ± 18.51	117.20 ± 2.35	<b>83.24</b> ± <b>27.16</b>	842.08 ± 102.34	925.32 ± 38.42	0.57 ± 0.06
Chak Karol	<b>8.34</b> ± <b>0.09</b>	<b>10.14</b> ± <b>0.09</b>	250.80 ± 14.04	<b>429.26</b> ± <b>7.70</b>	36.76 ± 2.67	<b>376.24</b> ± <b>32.52</b>	<b>413.00</b> ± <b>18.22</b>	0.73 ± 0.04
Chatrapura	7.32 ± 0.02	4.60 ± 0.08	<b>193.02</b> ± <b>12.50</b>	176.72 ± 1.08	55.40 ± 6.32	794.04 ± 130.02	849.44 ± 53.97	0.71 ± 0.02
Dalala bas	7.22 ± 0.12	6.32 ± 0.04	202.46 ± 17.98	83.00 ± 1.11	71.64 ± 3.39	846.76 ± 45.14	918.14 ± 92.22	0.49 ± 0.07
Kokabas	7.31 ± 0.26	5.28 ± 0.7	207.80 ± 34.91	191.00 ± 2.45	<b>33.92</b> ± <b>2.85</b>	830.58 ± 34.30	864.50 ± 87.54	0.68 ± 0.01
Lilia ka bas	7.31 ± 0.09	6.56 ± 0.10	325.10 ± 17.25	99.34 ± 1.10	55.72 ± 2.58	808.43 ± 53.86	864.15 ± 84.64	0.52 ± 0.07
Madanpura	7.20 ± 0.42	4.16 ± 0.07	284.60 ± 44.63	425.78 ± 4.58	72.20 ± 7.18	849.71 ± 40.77	821.91 ± 87.50	0.76 ± 0.02
Mansa bas	7.99 ± 0.14	7.06 ± 0.06	498.97 ± 47.64	423.52 ± 7.79	52.90 ± 7.52	567.74 ± 34.37	620.64 ± 22.62	<b>0.78</b> ± <b>0.02</b>
Mohanpura	7.29 ± 0.33	5.37 ± 0.12	283.82 ± 25.92	175.75 ± 1.88	64.40 ± 2.92	814.51 ± 56.80	878.91 ± 102.	0.72 ± 0.04
Rampura	<b>6.39</b> ± <b>0.26</b>	<b>2.17</b> ± <b>0.03</b>	226.42 ± 31.31	235.00 ± 1.98	78.65 ± 7.14	953.35 ± 113.40	<b>1032.00</b> ± <b>124.62</b>	0.53 ± 0.01
Shrirampura	7.39 ± 0.14	5.31 ± 0.09	531.60 ± 27.01	117.5 ± 2.45	46.76 ± 2.58	812.65 ± 32.20	859.41 ± 81.92	0.56 ± 0.01
Shukhia	7.33 ± 0.21	4.50 ± 0.05	<b>648.60</b> ± <b>59.16</b>	113.50 ± 2.54	44.44 ± 7.52	807.48 ± 80.47	851.92 ± 74.61	0.53 ± 0.01
Tellawala	7.20 ± 0.21	4.42 ± 0.06	325.10 ± 17.25	420.25 ± 5.49	72.90 ± 2.70	850.50 ± 53.80	923.40 ± 82.44	0.76 ± 0.02
Vatika	7.01 ± 0.14	3.24 ± 0.07	343.80 ± 10.45	174.57 ± 1.89	62.80 ± 2.80	<b>959.68</b> ± <b>22.22</b>	1022.50 ± 102.46	0.61 ± 0.03

The fluoride content in water sources of present study area ranged from  $2.17 \pm 0.03$  ppm to  $10.14 \pm 0.09$  ppm at Rampura and Chak Karol village respectively. However, the permissible limit of fluoride in drinking water is 1 ppm, but it may extend to 1.5 ppm in tropical areas where water is in less quantity. A positive correlation was observed between pH and fluoride as earlier reported by Teotia *et al.* (1981) and Trivedi (1988). Thus, all the samples have fluoride more than the permissible limit, which leads to various health hazards like- dental and skeletal fluorosis. The people of study area also complained for joint and abdominal pain.

### **Conclusion :**

The data suggests that the water samples were slightly alkaline in nature and contained high amount of fluoride. The other parameters *viz.*, Cl, pH, EC, Ca-H, Mg-H, TH, and TDS showed wide variations. Analysis of water samples indicate that the drinking water, used by the people residing in villages of Sanganer Tehsil, is not potable. It should be treated before using for drinking purpose.

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