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Drinking Water Quality of Schools in Theni District

A. JEYASEELI, T. KAVI PRIYA, M. R. DELPHINE ROSE[1] AND M. NARAYANAN

Department of Advanced Zoology & Biotechnology. St. Xavier's College (Autonomous)
Palayamkottai 627002, Tamil Nadu, India
[1]*Department of Zoology, Jayaraj Annapackiam College (Autonomous)*
Periyakulam, Tamil Nadu, India

Abstract

In the present study the physical and chemical parameters such as appearance, color, odor, turbidity, total dissolved solids, electro-conductivity, pH, total alkalinity, total hardness, calcium, magnesium, sodium, potassium, iron, free ammonia, nitrite, nitrate, chloride, fluoride, sulfate, and phosphate of drinking water supplied to schools in Theni district of Tamil Nadu were studied by collecting samples from twelve schools. Study reveals that the physico-chemical parameters are well within permissible limits of ISI, ICMR and WHO.

Key words : Theni district, Schools, Water quality.

Water is one of the most important and abundantly available natural commodity. It is an essential constituent of all plants, animals and human beings. There is a direct impact of quality of water used and human health. The utility of poor quality of drinking water may lead to several life threatening diseases. It was observed that around 20 million people are suffering from fluorosis (Prabhavathi et al. 2001, Jeyaseeti et al. 2006). Since the quality of public health depends to a great extent on the quality of drinking water, it is imperative to determine the physical and chemical characteristics of water to monitor the quality of water supply. The available literature has revealed that no scientific investigation was carried out with regard to the qualitative aspects of ground water for drinking purpose of schools of Theni district. Therefore, the present work was made to assess the water quality status of schools of Theni district.

Methods

The drinking water samples from 12 schools of Theni district of Tamilnadu were collected in good quality polythene bottles following the standard procedure. Sampling was carried out without adding any preservatives in rinsed bottles directly for avoiding any contamination and brought to the laboratory for the estimation of various physico-chemical parameters. Monitoring was done in November 2006. The schools are indicated by S_1 (SDA Matric HSS, Periyakulam), S_2 (Govt Boys HSS, Periyakulam), S_3 (Govt Girls HSS, Periyakulam), S_4 (Kallar HS, Endapudupatti), S_5 (Govt HSS, Vadugapatti), S_6 (Govt HSS, Silvarpatti), S_7 (Govt HSS, Jeyamangalam), S_8 (Govt HSS, Devathanapatti), S_9 (Renuga Vidyalaya, Lakshmipuram), S_{10} (Govt HSS, Lakshmipuram), S_{11} (Govt HSS, Thamaraikulam) and

Table 1. Physical parameters of drinking water in schools of Theni district.

Stations	Appearance	Color	Turbidity NT units	Total dissolved solids (mg/l)	Electrical conductivity (Micro mho/cm)
S_1	Clear	Colorless	1	535	765
S_2	Clear	Colorless	1	55	75
S_3	Clear	Colorless	2	55	75
S_4	Clear	Colorless	1	615	875
S_5	Clear	Colorless	1	475	680
S_6	Clear	Colorless	1	950	1360
S_7	Clear	Colorless	1	505	720
S_8	Clear	Colorless	1	165	235
S_9	Clear	Colorless	1	125	180
S_{10}	Clear	Colorless	1	125	180
S_{11}	Clear	Colorless	1	55	75
S_{12}	Clear	Colorless	1	120	170

Table 2. Chemical parameters of drinking water in schools of Theni district. All values are expressed in mg/l except pH.

Stations	pH	Total Alk	Total hardness	Calcium	Magne-sium	Sodium	Pota-ssium	Iron
S_1	7.7	208	220	44	26	50	15	0.1
S_2	7.23	20	30	8	2	3	1	0.1
S_3	7.33	20	30	8	2	3	1	0.1
S_4	7.6	320	340	68	41	40	2	0.3
S_5	7.65	280	300	60	36	20	1	0.2
S_6	7.91	200	500	100	60	80	10	0.1
S_7	7.92	224	240	48	29	40	5	0.2
S_8	7.75	76	80	16	10	15	2	0.1
S_9	7.64	50	60	12	7	10	1	0.3
S_{10}	7.69	50	60	12	7	10	1	0.2
S_{11}	7.3	20	30	8	2	3	1	0.1
S_{12}	7.36	50	60	12	7	6	3	0.2

Table 2. Continued.

Stations	Ammonia	Nitrite	Nitrate	Chloride	Fluoride	Sulfate	Phoso-phate	Tidy's Test
S_1	0.06	0.05	12	100	0.4	14	0.04	0.42
S_2	0.06	0.01	1	10	0.2	1	0.04	0.21
S_3	0.06	0.01	1	10	0.2	1	0.04	0.21
S_4	0.06	0.08	15	70	0.4	20	0.2	0.42
S_5	0.1	0.06	14	50	0.2	10	0.04	0.63
S_6	0.09	0.05	20	280	0.4	40	0.04	0.42
S_7	0.06	0.08	6	60	0.4	12	0.2	0.42
S_8	0.1	0.08	2	20	0.2	4	0.08	0.42
S_9	0.06	0.04	2	20	0.2	2	0.04	0.42
S_{10}	0.06	0.01	2	20	0.2	2	0.04	0.21
S_{11}	0.06	0.01	1	10	0.2	1	0.04	0.21
S_{12}	0.1	0.01	2	20	0.2	2	0.08	0.42

S_{12} (Govt HSS, Vaigai Dam). The procedures were followed following the standard methods (APHA et al. 1992).

Results and Discussion

Data on physical and chemical analysis of twelve schools of Theni district are given in Tables 1 and 2 and the standard values in Table 3. The appearance and color of the selected school water samples were clear and colorless. The turbidity is within the permissible limit and ranged from 1 to 2 NT units. The values of total dissolved solids and electro-conductivity varied from 55—950 mg/liter and 75—1,360 mmho/cm respectively. The pH of the selected schools water samples ranged from 7.23 to 7.92 which is well within the prescribed limit of 6.5 to 8.5 of the ISI standards (WHO 1992).

The total alkalinity of all the collected samples ranged from 20—30 mg/liter. Samples S_1, S_4, S_5 and S_7 have alkalinity values beyond the permissible limit of ISI (150—200 mg/liter). Alkalinity alone is not harmful to human beings (Pande and Sharma 1999). Excess alkalinity gives a bitter taste to water. Total hardness ranged from 30—500 mg/liter and in stations S_1, S_4, S_5, S_6 and S_7 the total hardness above the permissible limit (P=100 mg/liter, WHO 1992) and it is important in determining the suitability of a water for domestic and industrial uses.

Calcium values are varied from 8—100 mg/liter and these values are within permissible limits as prescribed by WHO (1992). In human body it is essential for muscular and nervous system, cardiac functions and in coagulation of blood. Therefore, low level calcium may have adverse effect on human health (Sharma and Singh Chandel 2005). In this observa-

Table 3. Standard physico-chemical values for drinking water. All values are expressed in mg/l except turbidity, EC and pH. P=Permissible limit ; E=Excessive limit.

Parameters	ISI		ICMR		WHO	
	P	E	P	E	P	E
Physical						
Color	10	50	5	25	5	25
Taste & Odor	Unobject	–	Unobject	–	Unobject	–
Turbidity	10	25	5	25	5	25
Electro-conductivity	–	–	–	–	500	1500
Chemical						
pH	6.5—8.5	6.5—9.2	7—8.5	6.5—9.2	7—8.5	6.5—9.2
TDS	–	–	–	–	500	1500
Alkalinity	–	–	–	–	120	–
Total hardness	300	600	300	600	–	–
Calcium	75	200	75	200	75	200
Iron	0.3	1.0	0.3	1.0	0.3	1.0
Chlorides	250	1000	250	1000	200	600
Sulfates	150	400	200	400	200	400
Nitrates	45	–	20	50	–	100
Fluorides	0.6—1.2	–	1.0	2.0	0.5	1.0—1.5

tion, magnesium values ranged from 2—60 mg/liter and these are well within the desirable limit. Magnesium rich water may cause the gastro-intestinal irrigation in the presence of sulfate containing large amount of Mg—SO_3 may be purgative and cause diarrhoea amongst the consumers.

Sodium and potassium values ranged from 3—80 and 1—15 mg/liter respectively. The presence of sodium is an important parameter the excess quantity of which can deteriorate the soils. The iron content ranged from 0.1—0.3 mg/liter and free ammonia from 0.06—0.1 mg/liter. Iron is considered as a nuisance in excessive quantities. Nitrite and nitrate values were between 0.01—0.8 and 1—20 mg/liter. The nitrate values are within the permissible limit. Nitrate is dangerous for human health especially in infant below six months of age.

Chloride values varied from 10—280 mg/liter and are within permissible limits as prescribed by WHO except S_6 (permissible 200 mg/liter). In reasonable concentrations these are not harmful to human beings and imparts salty taste beyond the concentration of 250 mg/liter. The fluoride content varied from 0.2—0.4 mg/liter. The presence of large amount of fluoride is associated with skeletal and dental fluorosis. Sulfate values varied between 1—40 mg/liter and within permissible limits. If the concentration is more than 500 mg/liter, it causes diarrhoea in human beings and cattle. Tidy's values ranged from 0.21—0.63 mg/liter.

The physico-chemical analysis of drinking water samples in schools of Theni district reveals that all the parameters are well within the permissible limit of WHO. However, monitoring is important to detect drinking water contamination and to provide an advanced warning to the consumers. The results of suitability evaluation denotes that there is no major hazard in selected drinking water samples in schools of Theni district of Tamilnadu.

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