Nature Environment and Pollution Technology
An International Quarterly Scientific Journal

ISSN: 0972-6268	Vol. 10	No. 4	pp. 613-616	2011

Original Research Paper

Groundwater Quality of Gadhinglaj Tahsil of Maharashtra

R. S. Sawant, S. D. Jadhav, A. G. Godghate and S. R. Patil
Department of Botany, Dr. Ghali College, Gadhinglaj-416 502, District Kolhapur, Maharashtra, India

Nat. Env. & Poll. Tech.
Website: www.neptjournal.com

Received: 31/5/2011
Accepted: 18/6/2011

Key Words:
Groundwater quality
Borewells
Gadhinglaj tehsil
Drinking water standards

ABSTRACT

The study deals with the groundwater quality of Gadhinglaj tehsil in Maharashtra. The groundwater quality was assessed by examining various physico-chemical parameters. The borewell water samples were collected from 40 villages from Gadhinglaj tehsil during winter season. The physico-chemical parameters like temperature, pH, EC, free CO_2, total alkalinity, total hardness, Ca and Mg hardness, chlorides and dissolved oxygen were analysed. The result were compared with WHO and BIS standards. Except for a few parameters at some places, most of the water samples were found to be suitable for drinking.

INTRODUCTION

Among the various sources of water, groundwater is said to be safer for drinking and domestic purposes. Several factors like discharge of agricultural, domestic and individual wastes affect the groundwater quality. The groundwater is often preferred for drinking and cooking purposes. Above 70 % of Indian population uses groundwater.

The quality of drinking water plays an important role in maintaining sound health. A safe water is one which is free from faecal contamination and conform to the limits of chemical contamination (Murugesan et al. 2004). Good quality water has become a precious commodity nowadays. The quality of water is getting vastly deteriorated due to unscientific waste disposal, improper water management and carelessness towards environment. This has led to scarcity of portable water affecting the human health (Agarkar & Thombre 2005). Contaminated water with faecal matter causes a number of diseases. The relation of polluted water and waterborne diseases like typhoid, dysentery and cholera through contaminated water is well known.

MATERIALS AND METHODS

Collection of samples: The borewell water samples were collected from 40 different villages in Gadhinglaj tehsil of Kolhapur district (Fig. 1) in December 2010 in plastic containers and brought to the laboratory for further analysis.

Analysis of physico-chemical parameters: Standard methods were followed for the analysis of water (APHA 1995, Trivedy & Goel 1984). Some parameters like temperature, pH and electrical conductivity were analysed in the field. The samples for dissolved oxygen were fixed in the BOD bottles at the site and brought to the laboratory for analysis by Winkler method. All the physico-chemical parameters were analysed within 24 hours.

RESULTS AND DISCUSSION

The results obtained from analysis of the water samples of different villages of Gadhinglaj tehsil are given in Table 1, and the drinking water standards (WHO 1988, BIS 1991) in Table 2. The physico-chemical data of the groundwater samples show different types of waters in the study area according to their hydrochemistry. All the drinking water samples were clear, colourless and odourless. The air temperature ranged from 24 °C to 29°C, and water temperature from 19°C to 21°C in all the samples.

The pH values ranged from 6.09 to 8.20. pH was alkaline in 37 samples, and acidic in three samples. One sample shows the pH below the permissible limit. However, higher values of pH hasten the scale formation in water heater and reduce the germicidal potential of chlorine. Electrical conductivity ranged from 0.28 to 1.77 mmho indicating that the values were within the permissible limit.

Free CO_2 values ranged from 4.4 to 66 mg/L. The free CO_2 concentration in water indicates the presence of decomposable organic matter, bacterial action on organic matter and physiological activities of biotic components. Total alkalinity of waters ranged from 18 to 300mg/L which was within the permissible limit. Most of the alkalinity in natural water is found due to dissolution of CO_2 in water. Alkalinity in itself is not harmful to human beings, yet the water samples with less than 100 mg/L are desirable for domestic use (Loganayagi et al. 2008).

Table 1: Physico-chemical characteristics of borewell waters of Gadhinglaj tehsil.

Sample No.	Temperature Air	water	pH	EC	Free CO_2	Alkal-inity	Hardness Total	Ca	Mg	Chloride	D.O.
S_1	28	21	7.12	0.54	8.8	50	266	80.02	45.19	73.84	6
S_2	26	21	7.78	0.51	8.8	52	180	56.14	30.09	65.32	4
S_3	27	21	7.58	0.82	13.2	74	400	112.2	69.91	90.88	4
S_4	27	21	8.06	0.50	11.0	54	270	76.19	47.09	56.8	6
S_5	26	20	7.36	0.44	13.2	40	200	59.34	34.18	48.28	6
S_6	25	20	7.80	0.39	8.8	30	116	33.68	20	28.40	4
S_7	25	20	7.80	0.28	17.6	26	80	20.05	14.56	42.6	5
S_8	28	21	8.17	0.41	13.2	34	150	46.51	25.14	39.76	4
S_9	25	20	8.05	0.32	11.0	26	128	14.43	27.5	36.92	3
S_{10}	25	20	7.25	0.29	8.8	28	100	21.65	19.03	22.72	8
S_{11}	24	20	6.80	0.29	11.0	18	74	22.45	12.52	34.08	7
S_{12}	24	19	7.20	1.77	22.0	110	400	104.26	27.86	275.6	4
S_{13}	25	19	7.70	0.54	6.6	30	220	56.14	39.81	85.2	4
S_{14}	25	19	8.00	0.46	15.4	26	84	16.04	16.51	65.32	3
S_{15}	25	19	6.84	0.63	6.6	42	260	80.02	43.73	73.84	6
S_{16}	26	20	7.40	0.58	6.6	49	254	80.02	42.27	36.92	6
S_{17}	27	20	7.72	0.67	8.8	53	260	88.22	41.74	68.16	6
S_{18}	26	20	7.05	0.52	8.8	46	212	57.74	37.48	39.76	6
S_{19}	26	20	7.35	0.60	8.8	58	240	85.01	37.66	28.40	5
S_{20}	24	19	7.13	0.54	13.2	40	200	39.34	34.18	48.28	6
S_{21}	24	19	7.30	0.60	30.8	60	132	32.08	24.28	56.8	8
S_{22}	27	19	8.20	0.90	26.4	50	120	35.28	20.58	176.08	7
S_{23}	26	20	8.40	0.95	26.4	40	96	30.47	15.92	181.76	7
S_{24}	24	21	7.90	0.70	61.6	50	60	17.64	10.29	42.6	10
S_{25}	24	21	7.51	0.68	30.8	300	372	104.26	65.06	105.08	4
S_{26}	25	21	7.72	0.66	26.4	254	310	96.24	51.94	93.72	5
S_{27}	25	19	7.40	0.35	44.0	300	280	76.19	49.52	28.40	4
S_{28}	26	20	7.3	0.59	66.0	200	400	105.86	71.47	25.56	6
S_{29}	27	20	7.2	0.39	30.8	34	134	40.1	22.81	34.08	4
S_{30}	26	20	7.8	0.32	17.6	36	100	25.66	18.06	25.56	5
S_{31}	24	19	6.09	1.53	22	82	520	168.42	85.43	14.2	4
S_{32}	26	19	8.24	0.33	13.2	30	74	21.65	12.72	45.44	5
S_{33}	26	19	7.82	0.44	8.8	46	200	60.15	33.98	34.08	6
S_{34}	26	19	7.34	1.30	35.2	80	640	184.46	110.69	198.8	6
S_{35}	27	19	7.11	1.51	35.2	80	640	168.42	114.59	227.2	5
S_{36}	25	19	7.87	0.65	4.4	30	110	32	18.95	85.20	7
S_{37}	24	20	7.25	0.71	4.4	54	200	57.4	34.65	65.32	4
S_{38}	24	20	7.32	0.61	4.4	48	300	80	53.46	54.0	4
S_{39}	26	20	7.85	0.68	15.4	60	320	26.5	71.20	71	6
S_{40}	25	19	7.17	0.50	2.2	50	260	18.5	58	31.0	7

Note: All values are in mg/L except pH, temperature (°C) and EC (mmho/cm).

The total hardness is due to the presence of divalent cations, of which Ca and Mg are the most abundant in groundwaters. The waters of the study area are classified according to hardness as suggested by Sawyer and McCarty (1967). In the present study the total hardness of water sample ranged from 60 to 640 mg/L. This indicates that out of 40 samples only 38 samples have total hardness content within WHO and BIS permissible limit of 600mg/L and two samples in excessive limit. Out of 40 samples, 1 sample felled in category of soft (< 60 mg/L), 10 samples in medium (60-120 mg/L), 5 samples in hard (120-180 mg/L), and 26 samples in very hard category (> 180 mg/L). Calcium hardness values ranged from 14 to 184 mg/L, which were within the permissible limit. Magnesium hardness ranged from 10 to 114 mg/L and was within the permissible limit of 50 to 150 mg/L of WHO (1998). Jain (1998) reported that high concentration of hardness (150 to 300 mg/L and above) may cause kidney problems.

Chloride occurs in all natural waters in widely varying concentration. Chlorides in excess of 250 mg/L impart a salty taste to water and people who are not accustomed to high chlorides may be subjected to laxative effects. Chloride values ranged from 14 to 275 mg/L. Out of 40 samples, one sample showed higher value of 275 mg/L.

Table 2: Drinking water standards of WHO (1963) and BIS (1991).

Sr. No	Parameters	WHO		BIS Requirement	
		Limit of general acceptability	Allowable limit	Desirable limit	Permissible limit in the absence of alternate source
1	pH	7 to 8	6.5 to 9.2	6.5 to 8.5	No relaxation
2	E.C.	300	-	-	-
3	Total Hardness	500	-	300	600
4	Calcium	75	200	75	200
5	Magnesium	50	150	30	100
6	Chloride	200	600	250	1000
7	Alkalinity	-	-	200	600
8	D.O.	4 to 6 (ppm)	3 (ppm)	-	-

Note: All values are in mg/L except pH and EC (mmho/cm).

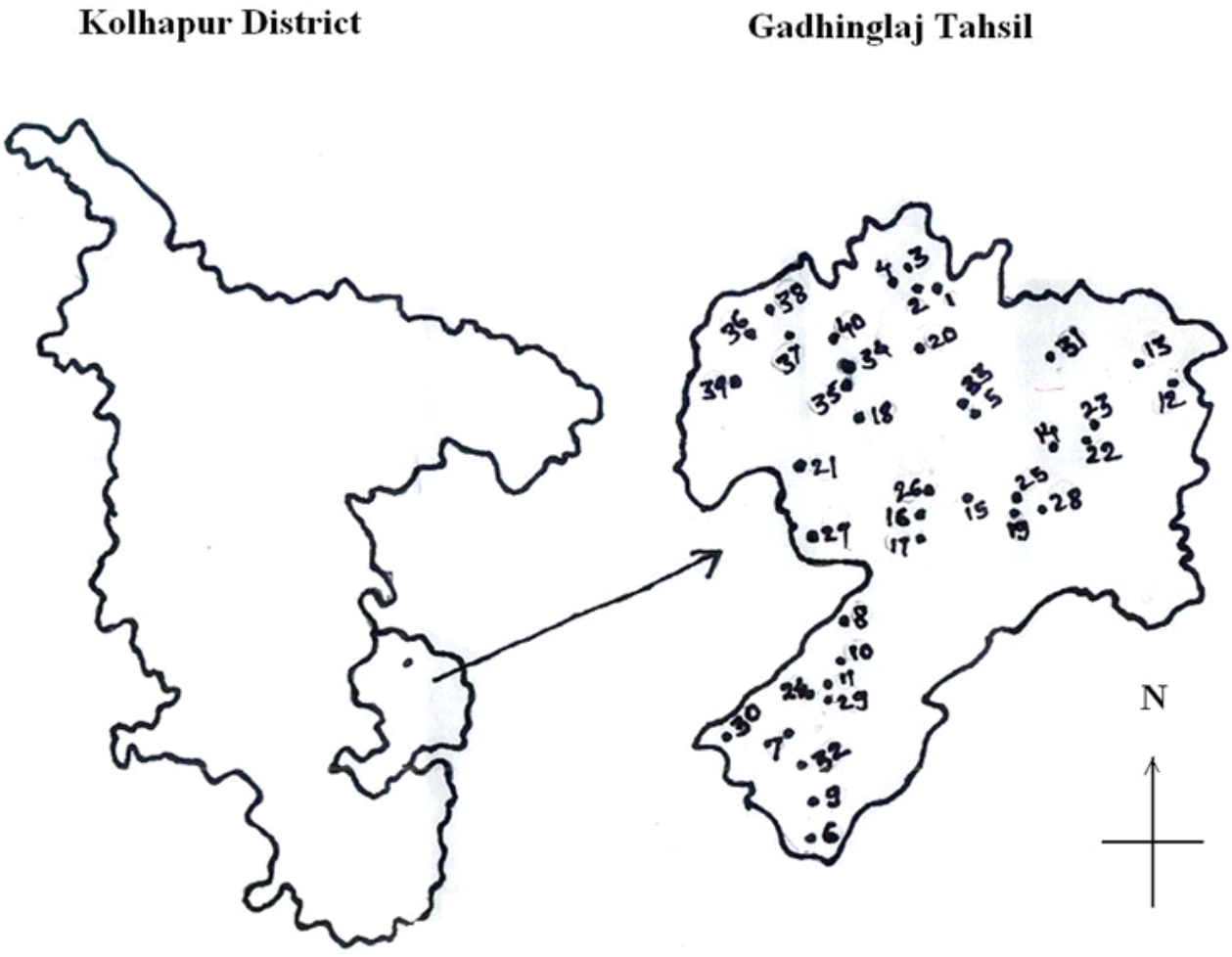

Fig. 1: Location of the study area and the sampling points.

Dissolved oxygen is an important parameter of water quality. Low dissolved oxygen gives bad odour to water due to anaerobic decomposition of organic matter (Sallae 1974). In the present study, dissolved oxygen values of water samples ranged from 3 to 10 mg/L. Out of 40 samples, 36 samples were within the permissible limit of WHO, while 4 samples exceeded the permissible limit.

REFERENCES

Agarkar, V. S. and Thombre, B. S. 2005. Status of drinking water quality in schools in Buldhana district in Maharashtra. Nature Environment and Pollution Technology, 4(1): 119-121.

APHA 2005 Standard Methods for the Examination of Water and Wastewater. 21st ed., American Public Health Association, Washington DC.

BIS 1991. IS:10400, Indian Standard for Drinking Water, 1-9, 179-182. Bureau of Indian Standards, New Delhi, India.

Jain, C.K., Bhatia, K.K.S. and Vijay, T. 1998. Groundwater quality in a coastal region of Andhra Pradesh. Ind. J. Envi. Hlth., 39(3): 182-192.

Loganayagi, A., Damodarkumar, S. and Murugesan, S. 2008. Quality of drinking water in and around Thiruvallur district, Tamil Nadu. Nat. Envi. & Poll. Tech., 7(1): 133-138.

Sallae, A.J. 1974. Waterborne diseases. In: Fundamental Principles of Bacteriology, 7th edition, Tata McGraw, Hill Publishing Company Ltd., New Delhi.

Sawyer, C.N. and McCarty, D.L. 1967. Chemistry of Sanitary Engineers. 2nd edition, McGraw Hill, New York.

Trivedy, R.K. and Goel, P.K. 1984. Chemical and Biological Methods for Water Pollution Studies. Environmental Publications, Karad, India.

Veera Bhadram, K., Ravindra, M. and Pradhanthi, M. 2004. Evaluation of water quality index at Vishakhapatnam city, Andhra Pradesh. Nat. Envi. & Poll. Tech., 3(1): 65-68.

WHO 1998. Guidelines for Drinking Water Quality. 2nd edn, Geneva, pp. 56.