Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

Der Chemica Sinica, 2017, 8(2):242-246

ISSN : 0976-8505
CODEN (USA): CSHIA5

Water Quality Evaluation of Mahatma Fule Arts, Commerce and Sitaramji Chaudhari Science College, Warud, Amravati

Atulkumar B Sahare*

Department of Chemistry, S.S.E.S. Amravati's Science College, Pauni Dist. Bhandara (M.S.) India

ABSTRACT

The water quality of Mahatma Fule Arts, Commerce and Sitaramji Chaudhari Science College, Warud was evaluated to access its potability. Five samples were collected from college premises for the study in March 2016. The physico-chemical properties like Temperature, pH, TA, EC, TDS, DO, TH, Ca Hardness, Mg Hardness, Cl^-, $SO42^-$, $NO3^-$, Sodium, and Potassium was analysed using standard methods. The analytical data was compared with prescribed standards of WHO and also with the data of Central Ground Water Board. The results show that only the treated water from RO system meets the standards and found potable. The other water samples were found hard and unfit for consumption.

Keywords: Mahatama fule college, Water quality, Warud, Physicochemical properties

INTRODUCTION

Water is a natural resource responsible for existence of life on earth. Without water life can never exist. The safe and clean potable water is essential for healthy living. The surface and ground water resources have major contribution to the improvement of social and economic life of people [1]. But, as a result of urbanization and industrialization natural water resources exploited very much and lead to many environmental consequences. The major consequence of exploitation of water resources is water pollution. Water for different purpose has its own requirement as purity. Therefore, water needs to be analysed on regular basis to confirm its suitability. The water can be analysed in field for single parameter like temperature, pH etc. while multi-component instrumental analysis carried out in laboratory. The unhygienic conditions and poor drinking water quality responsible for many diseases mainly in developing countries [2]. The major consequences of water pollution are deterioration of water quality and imbalanced aquatic ecosystems that threatens human health, affects economic and social prosperity [3]. Therefore, water quality determination is necessary to know its suitability for drinking purposes.

Presently water quality is an important global issue as it affects the human life by causing water borne diseases. In last few decades, increased human activity significantly polluted the water resources [4,5]. The major consequence of this water pollution is increasing number of cases of water borne diseases and health hazards [6]. Therefore, it is become necessary to monitor water quality, demand and pollution level of water [7]. Hence, all over the country water analysis is carried out on regular basis by different groups of chemists and biologists to check the level of water pollution and water born diseases [8,9].

An indispensable feature for preventing water born diseases and improving the quality of life is availability of consumable quality water [10]. The present study has been carried out by keeping this fact in mind. The main purpose of the study was to investigate the quality of water in the premises of Mahatma Fule Arts, Commerce and Sitaramji Chaudhari Science College, Warud, Dist. Amravati and try to examine the physicochemical composition of water and to assess the utility of water for drinking and recreation purposes.

MATERIALS AND METHODS

Mahatma Fule Arts, Commerce and Sitaramji Chaudhari Science College, Warud is situated in the Amravati district of Vidarbha region of Maharashtra State in India (**Figure 1**). It has become an important educational institution because it is one of the multifaculty institutions in this rural area and near about 4000 students studying in the institution. The college is situated in the bank of river 'Chudamani' originating from Satpuda ranges. This region is surrounded by many existing dams and very popular for orange cultivation. There are no industries in this area so the factors responsible for contamination are only domestic and agricultural wastes.

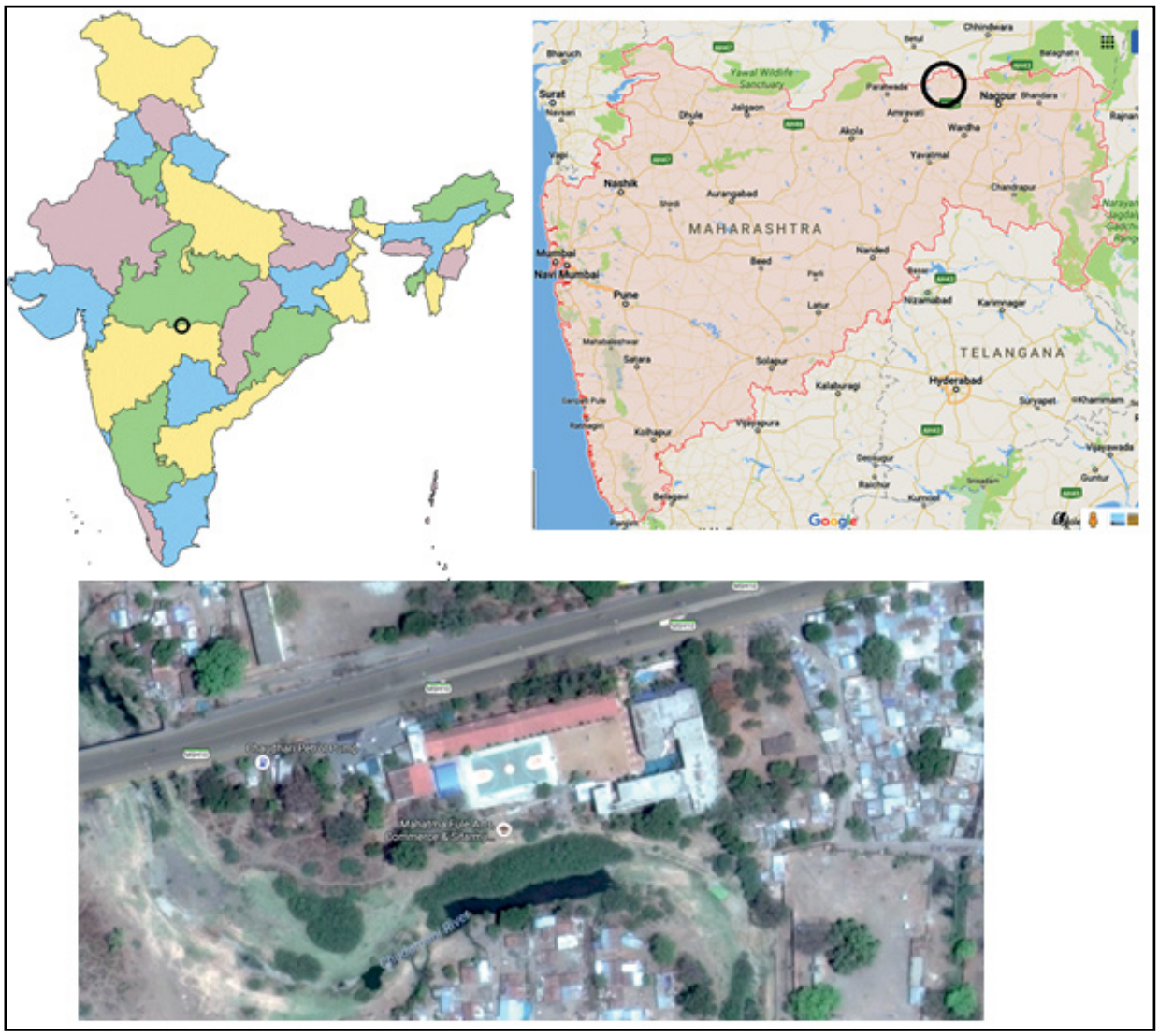

Figure 1: Satellite view of Mahatma fule arts, commerce and Sitaramji Chaudhari Science College, Warud.

The populations of this region dependent on water from open well, tube well as well as from municipal water supply for their daily need [11]. The wastewater generated is directly discharged into the river without treatment [12]. The literature survey shows that the water quality management is very poor and a few studies carried out on water quality of this region. Hence, the present study was planned and undertaken.

Collection of Water Samples:

Five samples were collected from the college premises in the month of March, 2016 and physico-chemical examinations were carried out as per standard methods. The water samples were collected in plastic bottles of two liters capacity [13]. The temperature of water samples was measured and DO was fixed during sample collection. The details are given below in **Table 1**.

Table 1: Sampling details of Mahatma Fule College, Warud.

Sr. No.	Sample Point	Sample No.
1	Open Well of College	S1
2	Chudamani River	S2
3	Open Well Near Petrol Pump	S3
4	Water from Municipal Water Supply	S4
5	Water from Reverse Osmosis System	S5

Physico-Chemical Analysis:

The various water quality parameters were analysed such as Temperature, pH, total alkalinity (TA), electrical conductivity (EC), total dissolved solids (TDS), dissolved oxygen (DO), total hardness (TH), Ca Hardness, Mg Hardness, Chloride, Sulphate, Nitrate, Sodium and Potassium using standard methods. The reagents used were of AR grade and solutions were prepared using double distilled water [14].

RESULTS AND DISCUSSION

The physico-chemical characteristics of all samples are shown in **Table 2**. It has been found that some samples do not meet the WHO standards.

Table 2: Water quality parameters.

Sr. No.	Parameter	S1	S2	S3	S4	S5	WHO Std.
1	Temperature (ºC)	23.3	22.1	24.2	23.9	25.8	--
2	pH	7.8	8.2	7.3	7.1	7.6	6.5-8.5
3	TA (ppm)	86	110	82	102	74	120
4	EC (µS/cm)	1018	996	1216	428	204	1400
5	TDS (ppm)	570	560	680	240	110	500
6	DO (ppm)	6.3	5.7	6.0	4.1	3.5	--
7	TH (ppm)	365	371	469	180	71	300
8	Ca Hardness (ppm)	209	255	232	108	45	75
9	Mg Hardness (ppm)	156	116	237	72	26	--
10	Chloride (ppm)	98	159	171	93	36	250
11	Sulphate (ppm)	0.94	1.62	0.64	0.48	0.12	250
12	Nitrate (ppm)	0.24	0.72	0.49	0.36	0.14	5
13	Sodium (ppm)	138	125	149	74	22	200
14	Potassium (ppm)	0.38	0.65	0.52	0.27	0.16	--

The following observations were made on the basis of tabulated values of water quality parameters:

The pH of water was found slightly alkaline (7.1 to 8.2) and minor fluctuation was recorded in pH [15]. It shows that the pH level of water was within the prescribed limit of WHO for domestic use.

The alkalinity is a measure of acid neutralizing capacity of water. Water becomes alkaline due to presence of minerals. The various ionic species that contribute to alkalinity include bicarbonate, phosphate, borate and organic acid [16,17]. The maximum alkalinity of 110 ppm and minimum of 74 ppm was observed in sample no. S2 and S5 respectively. For potable water, the WHO prescribed limit of total alkalinity is 200 ppm. The total alkalinity was found near the prescribed limits in present investigation.

Electrical conductivity is the measure of capacity of water to conduct electrical current. It is also a useful tool to check purity of water. Water conducts electric current due to presence of ions [18]. Maximum EC recorded at S3 was 1216 µS/cm and minimum at S5 was 204 µS/cm. The experimental data shows that EC of all water samples is within the permissible limits of 1400 µS/cm.

The maximum permissible limit of TDS for drinking water is 500 ppm suggested by WHO. The TDS in water is due to presence of minerals [19]. In present investigation, the TDS of all water samples ranges from 110 to 680 ppm. The TDS value is reach to the maximum (680 ppm) in the sample no. S3 (open well near petrol pump). The remaining water samples have TDS value (110-570 ppm). This level of TDS is acceptable for domestic and agricultural use. The water samples from S4 and S5 has TDS 240 ppm and 110 ppm respectively, so it is also useful for consumption.

The total hardness (TH) of water is a measure of soap foaming capacity. Water becomes hard mainly due to presence

of carbonates and bicarbonates of calcium and magnesium. Hence, TH is regarded as the summation of calcium hardness and magnesium hardness [20]. The present investigation has registered a high value of calcium hardness 255 ppm at S2 and high value of magnesium hardness 237 ppm at S3. Generally magnesium hardness remains less than calcium hardness, but it exceeds the calcium hardness to the maximum value of 237 ppm at S3. It may be due to some geological reasons. The total hardness has shown maximum value of 469 ppm for S3, it is very hard. The minimum total hardness of 71 ppm was found at S5 (Water from Reverse Osmosis System). WHO has suggested a limiting value of 300 ppm TH for potable water. If exceeds the limit, water become unsuitable for consumption [21].

The water samples under present investigation shows a significant presence of anions like chloride and sulphate. Chloride is essential element for life. It required in definite concentration level for normal cell functioning in plant and animal [22-24]. It is reported that high concentration of sulphate in potable water causes diarrhoea [25]. The concentration of chloride and sulphate in the present investigation ranges from 36-171 ppm and 0.12-1.62 ppm, respectively. The concentration of chloride and sulphate was found within the prescribed limit of WHO.

Nitrate in water comes from leaching of rocks, due to acid rains and pollution. Nitrate is the pollutant responsible for birth defects in new born babies [26,27]. The nitrate content of water samples ranges from 0.14 to 0.72 ppm. It is found within the permissible limit (<5 mg/l) prescribed by WHO.

All natural fresh water contains sodium and potassium. The major sources of sodium and potassium are weathering of rocks, disposal of waste water in natural water resources etc. [28]. The concentration of sodium and potassium ions in present investigation was in the range of (22-149 ppm) and (0.16-0.65 ppm) respectively. This indicates the sodium and potassium concentrations are within the permissible limits of WHO.

The ground water quality of Amravati district was evaluated by Central Ground Water Board, Ministry of Water Resources, Government of India in 2013. As per the estimation, stage of ground water development of Warud has been reached to 145.78% indicating that the ground water resources are over exploited. The physicochemical analysis of ground water samples of Warud shows the following average characteristics: pH (7.9), EC (1350 µS/cm), TA (335 ppm), TH (400 ppm) and Nitrate (124 ppm) [29]. When these values are compared with our results, it shows that the ground water of this area is highly conductive and very hard. It is unfit for consumption without proper treatment for softening.

CONCLUSION

The results of present investigation revealed that the water quality of Mahatma Fule Arts, Commerce and Sitaramji Chaudhari Science College, Warud has been assessed by comparing with the standard desirable limits of each parameter prescribed by WHO for drinking water. The analytical data shows that the maximum parameters are within the permissible limits of WHO except TDS and TH. Again the water from Reverse Osmosis System meets all the drinking water standards. Hence, it is prescribed to use the water only from Reverse Osmosis System for drinking purposes.

ACKNOWLEDGEMENT

The author is very thankful to Dr. D. V. Atkare, Principal, Mahatma Fule Arts, Commerce and Sitaramji Chaudhari Science College, Warud for encouragement, support and providing necessary laboratory facilities during the work.

REFERENCES

[1] The role of water in socio-economic development, Report 1 of IHP-II Project Cl, Unesco 1987, Paris.

[2] Mishra A, Bhatt V (**2008**) Physico-chemical and microbiological analysis of underground water in V.V. Nagar and nearby places of Anand district, Gujrat. *India. E J Chem* 5: 487-492.

[3] Jameel AA (**1998**) Physico-chemical studies in Uyyakondan channel water of river cauvery. *Poll Res* 17: 111-114.

[4] Ramachandraiah C (**2004**) Right to Drinking Water in India: Status, Issues and Challenges. *Indian Journal of Human Rights* 8: 115-130.

[5] Sirkar AG (**1996**) Water Quality Monitoring - A Case Study. *JIWWA* Oct-Dec: 215-220.

[6] Mishra A (**2010**) Comparative study of Physico-chemical and microbiological parameters on lotic and ground water in selected outlaying area of central Gujarat. *J Chem Pharma Res* 2: 174-177.

[7] Elizabeth KM, Naik LP (**2005**) Effect of polluted water on human health. *Poll Res* 24: 337-340.

[8] Nath D (**2001**) Water and soil characteristics of Narmada estuary before commensing of Sardar sarovar dam. *J Inland Fresh Soc India* 33: 37-41.

[9] Fawell J, Bailey K, Chilton J, Dahi E, Fewtrell L, et al. (**2001**) Fluoride in drinking water. WHO/IWA, London.

[10] Jang CS, Chen SK, Kuo YM (**2012**) Establishing an irrigation management plan of sustainable groundwater based on spatial variability of water quality and quantity. *J Hydrology* 414-415: 201-210.

[11] Kondulkar SR (**2015**) Physico-chemical analysis of ground water affected by Ganapati Visarjan. *Int J Adv Res Chem Sci* 2: 8-10.

[12] Rao VB (**2011**) Physicochemical analysis of selected ground water samples of Vijayawada rural and urban in Krishna district, Andhra Pradesh, India. *Int J Environ Sci* 2: 710-714.

[13] Sarjuddin J (**2013**) Statistical approach and assessment of physico-chemical status of ground water in near proximity of South Bank Canal, Tamil Nadu, India. *Arch Appl Sci Res* 5: 25-32.

[14] APHA (**1995**) Standard Methods for Estimation of water and Wastewater. American Public Health Association, American Water Works Association, Water Pollution Control Federation, New York.

[15] Bhatt V (**2011**) Organoleptic and physico-chemical properties of underground and reverse osmosis water used in V.V. Nagar and nearby places of dist. Anand (Gujarat). *Acta Chim Pharm Indica* 1: 51-56.

[16] Rajurkar NS, Nongbri B, Patwardhan AM (**2003**) Water quality status of River Umkhrah at Shillong. IJEP 23: 990-998.

[17] Ramesh M, Elamvaluthi K (**2013**) Physico-chemical analysis of Cauvery river water at Thanjavur due to its tributary-Uyakondan channel of river. *SVRM Sci J* 1: 29-35.

[18] Annalakshmi G, Amsath A (**2012**) An assessment water quality of river Cauvery and its tributaries Arasalar with reference to physico-chemical parameters at Tanjore, Dt. Tamil Nadu, India. *Int J App Bio Phar Tech* 3: 269-279.

[19] Atekwana EA (**2004**) Field evidence for geophysical detection of subsurface zones of enhanced microbial activity. *J Appl Geophys* 56: 281-294.

[20] Sayed RA, Gupta SG (**2010**) Groundwater quality evaluation in Beed City, Maharashtra India. *African Journal of Biotechnology* 1: 326-330.

[21] Patel N (**2010**) Study on the physico-chemical characteristics of ground water of Gulbarga city (Karnataka). *Int J Appl Biol Pharm* 1: 518-523.

[22] Matini L, Tathy C, Moutou JM (**2012**) Seasonal groundwater quality variation in Brazzaville, Congo. *Res J Chem Sci* 2: 7-14.

[23] Batayneh AT, Qassa HA (**2006**) Changes in quality of groundwater with seasonal fluctuations. *J Environ Sci* 18: 263-269.

[24] Sharada S, Yasovardhana N (**2013**) Study of Ground Water Quality at Selected Locations in Anantapur Town, Andhra Pradesh. *IJETED* 3: 320-327.

[25] Rao KS (**2012**) Water Quality Management-An Overview. *JOAC* 1: 155-166.

[26] Seenivasan (**2010**) Groundwater quality in Tirupur, Tamilnadu, India: A pilot-assessment. *Res Environ Life Sci* 3: 27-32.

[27] Rajurkar NS, Nongbri B, Patwardhan AM (**2003**) Physico-chemical and biological investigations of river Umshyrpi at Shillong, Meghalaya. *Indian J Environ Health* 45: 83-92.

[28] Ravichandran K, Jayaprakash M (**2011**) Seasonal variation on physicochemical parameters and trace metals in groundwater of an industrial area of north Chennai, India. *Indian J Sci Technol* 4: 646-649.

[29] Lamsoge BR (**2013**) Ground Water Information Amravati District Maharashtra, Government of India. Ministry of Water Resources, Central Ground Water Board.