The Asian Journal of Experimental Chemistry, **Vol. 4 No. 1&2 (June & December, 2009) : 23-25**

Research Paper :

Seasonal variation in drinking water quality of Shikohabad city in U.P. (India)

B.K. SHRIVASTAVA AND ARVIND KUMAR

Accepted : ***February, 2009***

See end of the article for authors' affiliations

Correspondence to:

ARVIND KUMAR
Department of Chemistry,
Narain (P.G.) College,
SHIKOHABAD (U.P.)
INDIA

ABSTRACT

Drinking water quality of Shikohabad city has been analysed by various physico-chemical anlaysis. Measurements of all the parameters were carried out seasonally at about fifteen sampling sites. The borewells near solid waste storage and low lying areas are chosen for study. Variation in the values were recorded due to municipality sewage water and solid waste contamination.

Key words : Drinking water quality, pH, Dissolved oxygen, Total alkalinity, Turbidity

Shikohabad is situated in Firozabad district famous for glass industries. The main source of drinking water are borewells of municipality and personal jet pumps. People of the city are using exausting non-renewable ground water badly. The unplanned urbanisation and industrialization have resulted into the changes in physico-chemical parameters which clearly indicates the water quality. It is very important for effective monitoring that water sampling and analysis must be carried out properly. In the present study the examination of water quality by different physico-chemical parameters have been carried out seasonally to note the changes in water quality in different seasons.

MATERIALS AND METHODS

The water samples were collected monthly in sterilized jerrycanes and brought to the laboratory with necessary precautions for analysis of the physico-chemical properties (APHA, 1989 and Trivedy *et al.*, 1987). Reagents used were of AR and GR grade. Temperature with dissolved oxygen and pH were determined on the spot by water analysis kit and pH-meter. Total alkalinity was measured by volumetric analysis by titrating with 0.02 N H_2SO_4 using methyl orange as indicator. The total hardness was determined by using EDTA and Eriochrome black T indicator until colour changes from purple to blue. Ca–H was determined by using Patten and Reader's reagent. The trace elements were determined by Perkin Elmer Atomic Absorption Spectrophotometer Modal 2380.

RESULTS AND DISCUSSION

The physico-chemical characteristics of the drinking water of Shikohabad is summarised in the Table 1. Temperature plays an important role in rate of reaction as it increases rate of reaction of water. Temperature in Shikohabad varies in between 25.0 – 40^0C.

The pH range of drinking water of Shikohabad is in permissible limits (7.2-8.5) but carbonates and bicarbonates are present in high quantity. The turbidity level is very high and has been found in the range of 12 – 13 NTU as compared to standard value of 5 NTU (WHO) and 10 NTU (IS 1983). The increase in turbidity level is due to sewage percolation and some organic colloidal compounds.

Total alkalinity found varies in between 58.4 – 72.4 ppm. The higher values are due to leaching of soil during natural filtration of water. Biological oxygen demand (BOD) and Chemical oxygen demand (COD) were found to be 0.8 – 3.8 ppm and 3 – 10 ppm well within the permissible limit, therefore water quality of Shikohabad is suitable for production of energy for growth and reproduction.

Higher percentage of nitrates in water is responsible for lower gastric acidity in human kids, but the nitrate concentration in water of this place has been found to be in limit (0.08-1.2 ppm). Higher concentration of Iron makes water bitter in taste but it has been found to be in the range of (0.19-0.50 ppm) (0.01-1.0 ppm IS). Cu is also present in the permissible limit (0.01-0.02). Similarly, Mn (0.08 – 0.10 ppm), Zn (0.10 – 0.98 ppm), Na (8.00 – 17.00 ppm) and K (8.00 – 16.00 ppm) have been found to be within permissible limits of ICMR, WHO etc.

The dissolved oxygen values were low during summer and increased during winter. The low D.O. values in summer may be due to the decreased oxygen holding

Table 1 : The physico-chemical characteristics of the drinking water of Shikohabad

Parameter	Units	Monsoon		Winter		Summer	
		July	October	November	March	March	June
Temperature (Water)	^{0}C	28.4	30.2	20.0	27.0	27.0	40.0
pH	-	7.0	7.6	7.2	7.6	7.4	7.9
Turbility	N.T.U.	20.8	30.0	12.0	18.0	18.0	20.0
Chloride	mg/l.	65.0	110.0	58.5	69.8	68.4	61.3
Total hardness	ppm	292	310	320	440	265	300
Ca – H	ppm	268	250	285	270	248	260
Mg – H	ppm	14.8	98	98	70	69	100
Total alkalinity	ppm	58.4	160.4	160.2	172.4	98.4	110
Dissolved Oxygen	ppm	3.3	3.7	3.5	3.7	2.1	2.9
B.O.D.	ppm	3.8	2.4	1.8	0.80	0.89	3.2
C.O.D.	ppm	8.0	9.8	10.0	3.0	3.0	7.8
Nitrate	ppm	0.8	1.0	0.9	1.1	1.2	0.9
Iron	ppm	0.50	0.30	0.23	0.27	0.19	0.26
Copper	ppm	0.012	0.015	0.01	0.018	0.010	0.020
Mangnese	ppm	0.06	0.08	0.07	0.09	0.10	0.08
Zinc	ppm	0.80	0.92	0.84	0.079	0.10	0.98
Sodium	ppm	15.0	9.0	8.0	12.0	14.0	17.0
Potassium	ppm	16.0	10.8	8.40	11.8	8.0	12.8

capacity of water at high temperature (Shastri *et al.,* 1991). In winter the oxygen holding capacity of water increases due to low water temperature. D-Oxygen produce energy for growth and reproduction.

At high temperature hardness of water decreases due to dissociation of chloride and carbonate salts of calcium (Arvindra *et al.,* 1998). In this study total hardness, Ca hardness and Mg hardness ranges from 265-440, 248-385 and 14.8- 59.0 ppm, respectively. Ca, Mg, sulphate nitrate and chlorides are responsible for total hardness. The permissible limit for total hardness, Ca – hardness and Mg- hardness is 200-300, 75–100 and 30 – 50 ppm in ICMR and IS. Higher concentration of $CaCO_3$, which is the hardest is recorded in winter season. Total hardness has also been confirmed by increase of soap consumption.

Total alkalinity varies from 58.4 – 172.4 ppm. Higher values are due to leaching of soil during natural filtration of water.

The amount utilized by micro organisms in stabilizing the organic matter is known as Biochemical oxygen Demand (BOD). Self purification of water is dependent on values of BOD, here the BOD ranges from 0.8 – 3.8 ppm while COD from 30 – 10.0 ppm.

Leaching of Nitrates with percolation of water is responsible for the Nitrate concentration in sample. Nitrate concentration in the present study is between 0.08–1.2 ppm, which is within the permissible limit. Nitrate poisoning is main cause of lower gastric acidity in human kids.

Total iron concentration in all the samples ranges from 0.19 – 0.50 ppm, while the permissible limit is 0.01 – 1.0 ppm (ISI, 1983). The higher value of iron concentration makes water bitter.

Copper (Cu) is an essential element for human body but high intake may cause liver damage. According to Indian standards the permissible limit of Cu is 1.0 ppm for drinking water and here it is between 0.01 – 0.02 ppm.

In ground water Mn occurs in dissolved and suspended forms. In the present study it varies between 0.08 – 0.10 which is within the ICMR limit.

Zn concentration in present study is within the range of 0.10 – 0.98 which is in permissible limit. Usually it is seen that industrial and agriculture waste increases the Zn concentration.

Sodium (Na) is increasing in ground water due to the discharge of effluents to open water bodies. Na plays an important role in maintaining blood pressure here it ranges from 8.0 – 17.0 ppm which is within the limits.

Potassium (K) concentration in ground water is less than Na, Ca and Mg. In all the samples it is between 8.00 – 16.0 ppm which is within the limits. K – intake directly effects the kidney function (WHO, 1972).

Acknowledgement:

Authors are greatly indebted to the principal and the management of Narain (P.G.) College, Shikohabad

and K.K. (P.G.) College, Etawah for providing laboratory facilities.

Authors' affiliations:
B.K. SHRIVASTAVA, Department of Chemistry, Narain (P.G.) College, SHIKOHABAD (U.P.) INDIA

REFERENCES

1. Standard Methods for the examination of water and waste water (1971) APHA, AWWA and WPCF, 13th Ed,, New York
2. **Bolenback, W.M. Jr** (1983). Ground water and wells Johnson Division OOP Inc. Minnesota.
3. Methods for chemical analysis of water and wastes (1967). EPA 625-6-74-003. a. USEPA Washington DC.
4. **Haynes, R.** (1982). Environment Methods, Chapman and Hall, London.
5. **I.C.M.R.** (1975). Water quality standard I.C.M.R. special publication No. 44 : 21.
6. **IS : 10500** (1983). Indian standard specification for drinking water ISI New Delhi, IS : 10500.
7. **NEERI** (1986). Manual on waste water and waste water Analysis Natinal Environmental Engineering Research Institute, Nagpur 340.
8. **Trivedy, R.K.** and Goel, P.K. (1986). *Chemical And Biological Method For Water Pollution Studies.* Environment Publication, Karad.
9. **Aravindra, H.B.,** Manjappa, S. and Puttaiah, E.T. (1998). Correlation coefficients of some physico-chemical parameter of river Tungabhadra, Karnataka, *Poll. Res.*, **17** (4) : 371 – 375.
10. **WHO** (1972). Geochemical Environment Trace Elements and Cardiovascular Diseases. *Bull.*, 47.
11. **WHO** (1978). Environment al Health Criteria, 5. World Health Organisation, Geneva.

****
******
***