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MONITORING OF DRINKING WATER QUALITY OF M.I.D.C. OF WARDHA CITY, MAHARASHTRA

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ABSTRACT
A study of water samples collected from the historical area, M.I.D.C. of Wardha (M. S.) has been carried out to examine its potability for domestic purposes. The physicochemical parameters like temperature, colour, odour, temperature, density, surface tension, viscosity, alkalinity, acidity, chloride, hardness, total dissolved solids(TDS), total suspended solid, pH, conductivity, sulphate, COD, BOD, pathogen, sulphate were studied by using various analytical techniques. Sodium& Potassium were determined Flame photometrically. The parameters were analyzed & compared with standard values prescribed by American Public Health Association (APHA) & World Health Organization.
Keywords: Monitoring, Physicochemical parameters, M.I.D.C.

INTRODUCTION

Wardha is an important city in India due to "Bapu-Kuti" of Mahatma Gandhi. Water is one of the most precious gifts of nature to mankind. Due to over exploitation & pollution, fresh water has become a scarce commodity. Increasing population &its necessities have lead to mark deterioration in water. Physicochemical studies on bore well water of Dohod, Gujarat were studied[1]. Water quality depends on efficacy of disinfection, temperature, solar rays etc.

The quality of ground water is the resultant of all the processes and reactions that act on the water from the moment it condensed in the atmosphere to the time it is discharged by a well or spring and varies from place to place and with the depth of the water table[2].

EXPERIMENTAL

In the present study, water samples have been collected from M.I.D.C area of Wardha (M. S.). Samples were collected in polythene and glass bottles with necessary precautions[3].

All chemicals used are of A. R. grade. Double distilled water is used for the preparation of solutions & reagents. The water quality parameters considered for the examination in the study are temp, color, turbidity, density, viscosity, surface tension conductance ,pH, TDS, hardness, alkalinity, acidity, DO, COD, BOD, chloride, sulphate were studied by using various analytical techniques.. Sodium& potassium were determined Flame photometrically. All the parameters were evaluated by the standard methods prescribed by APHA[4]. Calcium & Magnesium hardness of water was estimated by complexometric titration method[5].Chloride contents were determined volumetrically by $AgNO_3$ titrimetric method using potassium chromate as an indicator & was calculated in terms of mg/lit.

RESULTS AND DISCUSSION

The physicochemical data of water samples (mean values) were collected in November-2010 are presented in Table-1.

Temperature

All physiological activities & life processes of aquatic organisms are generally influenced by water temperature. In the present study, temperature range from 24-25^{o}C.

pH: pH value of drinking water is an important index of acidity, alkalinity & resulting value of the acidic-basic interaction of a number of its minerals & organic components. pH below 6.5 causes corrosion in pipes, resulting in release of toxic metals. pH of water in the studied region was found to be 7.2, which lies in the range prescribed by APHA[4].

Density, Surface Tension and Viscosity

Density was 1.0558 gm/cm^3. While surface tension was 78.313 dyne/cm. Viscosity was calculated as 0.9087X10^{3}Kg/m^2/sec which was in the comparable range.

Electrical Conductance: Conductance measurements give a rapid & practical instrument of variation of dissolved minerals content of a water sample. In our study electrical conductance was instrumentally measured as 0.33 μM.

TDS

According to WHO & Indian standards, TDS values should be less than 500 mg/lit for drinking water. In the present study, TDS was calculated to be 800mg/lit. The findings indicate that the sample of MIDC just crosses the permissible limit suggested by WHO & Indian standards[6]. However, the reason for high TDS is not clear.

Hardness

The hardness of water is not pollution parameter but indicates the water quality mainly in terms of Ca^{++} & Mg^{++} expressed as $CaCO_3$. It is the property of which prevent the lather formation with soap. Calcium is needed for the body in small quantity through water provides only a part of total requirement[7].

The acceptable limit of total hardness is 200 mg/lit which can be extended to 600 mg/lit (ISI 1982). The hardness values are not within permissible limit. However, temporary hardness was found to be 25.64mg/lit which can be removed by boiling .Permanent hardness was found to be 974.32mg/lit.

Alkalinity

In the present study, total methyl orange alkalinity was found to be 5.8mg/lit. The acceptable limit of total alkalinity of water sample is 500 mg/lit

Dissolved Oxygen (DO)

If dissolved oxygen concentration drop below 5 ppm, fish will be unable to live for very long. All clean water species such as trout or salmon will die well above this level and even at low oxygen fish such as catfish and carp will be at risk below 5ppm. The DO was calculated to be 3.0 mg/lit. It may be due to intrusion of high organic load in the water which leads to oxygen depletion.

Biological Oxygen Demand (BOD)

Urban runoff carries pet wastes from streets and sidewalks, nutrients from lawn fertilizers, leaves, grass clippings, and paper from residential areas, which increase oxygen demand. Biochemical oxygen demand is a measure of the quantity of oxygen used by microorganisms (e.g., aerobic bacteria) in the oxidation of organic matter. BOD of effluent determined was 17.5 mg/lit. This BOD of the studied water sample is higher than WHO standard. This high level of BOD is an indication of the contamination.

Chemical Oxygen Demand (COD)

Solids concentration is important characteristic of wastewater .COD determines the oxygen required for the chemical oxidation of organic matter. COD values conveyed the amount of dissolved oxidizable organic matter including non-biodegradable matter present in it. COD value in sample effluent was found to be 3.2 mg/lit. This is higher than range of WHO standards.

Chloride

The chloride content in the sample was 36.868 mg/lit. Natural water contains low chloride ions. Finding indicates that chloride ion concentration is below the permissible limit of chloride in drinking water prescribed by Indian Standard Index[5].

Sulphate ion concentration (SO_4^{2-})

Sulphate usually occurs in natural water. This is also an important anion imparting hardness to the water. The SO_4^{2-} ion concentration in the studied water sample was found to be 150 mg/lit. It is within the WHO permissible limit which is 200 mg/lit.

Chloride: In potable water, the salty taste produced by chloride concentration is variable & dependant on the chemical composition of water. Chlorine in the form of chloride ion is one of the major inorganic

anions in the water and waste water. The presence of chloride in natural water discharge can be attributed to the salt deposits, sewage discharges etc. Each of these sources may cause the local contamination of both surface and ground water. Chloride content in the studied effluent was found to be 76.4 ppm. This level of chloride content is just well within the permissible limit of WHO standards.

Sodium

The level of sodium in water is particularly important to people who have to watch their sodium intake for health reasons. Too much sodium has been identified as a risk factor for high blood pressure, Twenty milligrams sodium per liter suggested as safe. Sewage is one of the important sources of sodium to the fresh water. Water with high sodium content is also not suitable for agriculture as it tends to deteriorate the soils for crops. Sodium associated with chloride and sulphates make the water unpotable. Sodium concentration was not found in the sample flame photometrically.

Potassium

The concentration of K is quite lower than Na. It remains mostly common in solution without undergoing any precipitation. Potassium concentration was not found in the sample.

Nitrogen

Analytically organic nitrogen and ammonia can be determined together and have been referred as 'Kjeldahl Nitrogen'. Organic nitrogen includes such natural materials as proteins, peptides, nucleic acid, urea and numerous synthetic organic compounds. Typical organic nitrogen concentration varies from a few hundred micrograms/lit in some lakes to more than 20mg/lit in raw sewage. Knowledge of nitrogen in waste water is important when it is used as an irrigant. In the investigated sample, nitrogen is not found.

Acidity

Acidity is a measure of the effects of combination of compounds and conditions in water. It is the power of water to neutralize hydroxyl ions and is expressed in terms of calcium carbonate. Water attain acidity from industrial effluents, acid mine drainage, pickling liquors and from humic acid. No phenolphthalein acidity and methyl orange acidity was found in the studied water sample.

Pathogens

Microorganisms are not visible to the naked eyes. Their presence may be inferred by either direct visual observation or by analyzing the specific chemical products they produced. The bacteriological qualities of water are good indicators of the pollution and play key roles in water borne diseases. Bacterial counts are performed by making appropriate dilution of the sample and incubating at a specified temperature and culture medium for 48 hours. The numbers of bacterial colonies on the plates were counted under a microscope. The tests are based on the assumptions that even a single living micro-organism present in the sample will grow in culture medium and produce a colony for potable water sample the pathogen observed was *Salmonella species* which is gram negative and short rod shape.

CONCLUSION

In conclusion it can be stated that the different studied physico-chemical parameters such as colour, odour, temperature, density, surface tension, viscosity, alkanity, acidity, chloride, hardness, total dissolved solids, total suspended solid, pH, conductivity, sulphate, pathogen are within the permissible limit. BOD, DO, COD exceeds WHO acceptable limit. The high level indicates that there could be low oxygen available for living organisms in the wastewater.Whereas the high value of BOD is an indication of the contamination. The present investigation has led us to conclude that the quality of water samples subjected to study was acceptable from majority of physico-chemical parameters.In order to combat water pollution in MIDC area, Wardha we must understand the problems & undertake remedial measures. So, it is advisable that water should be treated to remove excess of hardness by boiling & ion exchange.

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Table-1: Physico-chemical parameters

S.No.	Parameter	Units	
1	Colour	-	Colourless
2	Turbidity	-	No
3	Temperature	^oC	24-28^{0}C
4	pH	-	7.25
5	Density	gm/cc	1.0558
6	Surface Tension	dyne/cm	78.313
7	Viscosity	Kg/m^2/sec	0.9087 X 10^3
8	Conductance	µM	0.33
9	Total Dissolved Solid	mg/lit	800
10.	Hardness		
	Temporary Hardness	mg/lit of $CaCO_3$	25.64
	Permanent Hardness	mg/lit of $CaCO_3$	974.32
	Total Hardness	mg/lit of $CaCO_3$	999.96
12	Total methyl orange Alkalinity	mg/lit	5.8
13	Dissolved Oxygen	mg/lit	3.0
14	Chloride	mg/lit	36.868
15	Sulphate	mg/lit	150
16	Acidity	15.6	4
17	Sodium	ppm	0
18	Potassium	ppm	0
19	BOD	mg/lit	17.5
20	COD	mg/lit	3.2

REFERENCES

1. C.K. Jain, K.K. Batia and T. Vijay, Ground water quality monitoring and evaluation in and around Kakinada, Andhra Pradesh, Technical Report, CS (AR) 172, National Institute of Hydology, Roorkee, 1994-1995(1995).
2. A.K. Rana et al., *Asian J. Chem.*, **14 (3-4)**, 1178(2002).
3. E. Brown, M. W. Skovgsted and M. J. Fishman, Methods for collection and analysis of water samples for dissolved minerals and gases, 5 (1974)
4. APHA, Standard methods for examination of water and wastewater 16th edition, New York (1985).
5. A. I. Vogel, Text Book of qualitative inorganic analysis, 4th Edn., ELBS, Landon (1978)
6. The Gadget of India: Extraordinary, Part-11, 36, 11 (1991).
7. A. G. Dhembare, G. M. Khande and C. R. Singh, *Pollution Research*, **17**, 87 (1998)

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