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Research Article

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Study on physico-chemical parameters of water of lower Kolar dam near Telangkhedi premises, Tahasil Saoner, Maharashtra, India

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ABSTRACT

Looking to the increase in need of fresh drinking water for Saoner city, the study was carried out to find out the feasibility from local water bodies. The search was carried out initially for the major reservoirs and then smaller lakes. The present work is on the determination of different physico-chemical parameters and the ultrasonic parameters from the density and ultrasonic velocity measurements to verify any relationship between them. From the data collected at three different places of the same site, it is observed that the water bodies nearer to the residential places found to be having more values of TDS, Alkalinity and Hardness but not too high to be non-potable. Here it is observed that the ultrasonic velocity of these water bodies also occurs to be at higher side and so the corresponding values of compressibility and acoustical impedance were determined. The overall result shows that the parameters like pH, TDS, alkalinity, hardness, calcium, chlorine and iron were found to be within the permissible limits. Therefore the water can be suitable for the use of drinking purpose and agricultural use with fish culture also.

Key words: Potability of water, alkalinity, hardness, ultrasonic velocity, Dissolved salts

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INTRODUCTION

Water is the most important constituent for the existence of life, a precious gift of nature to all species living on the earth. Water of acceptable quality is essential not only for drinking and domestic purposes but also for agriculture, industrial and commercial uses. The main water resources comprises of marine, coastal, surface water and ground water that supports all living things. Surface water is collection of water on the ground or in a stream, river, lake and dams, wetland, or ocean. The main source of water is the surface water. The lakes and dams are large bodies of water surrounded by land and inhabited by various aquatic life forms. They are subjected to various natural processes taking place in the environment, such as the hydrological cycle[1,3,4].

Tremendous population growth and rapid urban development's with so called modernizations, industrialization, water is fast becoming a scare commodity. Lakes and dams are facing various environmental problems resulting in deterioration of their water quality. The demand for quality drinking water goes on increasing year by year[1]. In India most of the dams are providing the fresh water to nearby cities.

As per the Indian Constitution, water is in the domain of the states with the central government only advising the states by issuing a non-binding National Water Policy. India's National Water Policy 2002 prioritizes the use of water in the following order: drinking, irrigation, hydropower, ecology, agricultural and non-agricultural industries,

navigation and other uses.[8,10]. The water sector is fragmented, with separate agencies responsible for irrigation, domestic and industrial water supply. The level of ground water is deepening day by day. The bore wells can be seen having the deep bores up to 800, 900 feets with very small out puts. Therefore the demand on dams increases. The level of pollution is increasing in every source, the increasing industrial area adds in to the problems.

Looking in to the need of sources of fresh water the search for nearest water bodies was carried out. The area selected for the study, to estimate the water quality and levels of water pollution, was the Telangkhedi dam (kolar dam) near to Saoner city in Nagpur district. The area near Saoner is rich in coal hence a coal mines are situated in Saoner. It is famous for its coal mines, textile and paper industry. The primary occupation of its people is farming. Nearly 65% of the people are engaged in growing oranges on 80% of available nearby land. But coal mines have brought employment opportunities in this region. The study area of the telangkhedi dam was the place where the human activities like discharge of domestic sewage and washing of vehicles, bathing of animals, are the main sources of pollutants at some of the sites nearer to the residential areas otherwise there will be no other activities prominently observed. Hence the study has been carried out to analyze physico-chemical and ultrasonic parameters of the dam,

The new aspect in this study was to find out existence of any relationship between these physicochemical parameters and the ultrasonic parameters.

EXPERIMENTAL SECTION

The method used here is collection of samples and detecting the various parameters in the laboratory.

Sample collection:
Surface water samples from the Telengkhedi dam were collected from different sampling sites. The water samples were collected in clean sterile plastic containers from three different sites during March to May after 10am. The samples were transported to the laboratory within 3 hrs for analysis of physicochemical parameters and ultrasonic parameters.

Physico-chemical parameters:
The parameters of the water like temperature, pH, total dissolved solids (TDS) and electrical conductivity were determined in situ with the help of thermometer, pH meter (Hanna), TDS meter (Hanna) and conductivity meter. The parameters, such as Color, Hardness, Alkalinity, Chlorides, Iron, Calcium, Silica, total solids (TS), total suspended solids (TSS), were analyzed in the laboratory.

Ultrasonic parameters:
The ultrasonic velocity of the samples were measured using the Interferometer at fixed frequency of 2 MHz and constant temperature, the density measurements were carried out using the density bottle and mono pan balance and the viscosity measurements were done by the suspended level viscometer. The compressibility, acoustical impedance and free volume with internal pressure were determined from this data for comparing with the physicochemical parameters.

The process of collection, preservation and analysis of various parameters samples were carried out, by following the standard methods (APHA, 1995). Each analysis of samples was performed three to four times and mean of the values were used for further conclusions. The results obtained were compared with the standard values of World Health Organization (WHO) and Indian drinking water standards.

All the quantities of various parameters and different elements were correlated with the ultrasonic parameters of the sample to find out any significant relationship between the physicochemical parameters and ultrasonic parameters.

RESULTS AND DISCUSSION

The water samples analyzed here for Physico-chemical characteristics and the results of various parameters are compared with the standard values and are presented in Table 1.

The data of these parameters shows that for all samples the color is agreeable. The average temperature of the water in a day is 31.4 and 34.5^{0}C which appears to be different due to the variation in the temperature of the day and site of water bodies. pH of the samples varies from 7.9 to 8.12 which is moderately alkaline and within the range of prescribed standard (pH 6.5-8.5). The range of TDS appeared in the samples is 149 to155 mg/l. The values of TDS are very small as compared to the TDS of the ground water and the acceptable according to the drinking water standard of WHO, 1993. The water from all the samples is having hardness in the range of 115 to 120 ppm, which is also acceptable. The samples are found to be moderately alkaline and lie in the range of 124 to 126. The appearances of Chlorides in the samples collected from different sites are in the range of 20 to 25 mg/l. This is very small as compared with the permissible amount. Amount of Iron in water should be small than 0.3 in both the samples the Iron contain is small than 0.3 mg/l. The other solid such as calcium as prescribed by WHO standard should be in the limit of 75- 100, the detected average value of the calcium lies in the range of 62 and 64 mg/l. The amount of silica is observed from 14 to 16 ppm. Many times the rivers are used for the washing purposes and the detergents would enhance the load of this element. The total dissolved solids (TDS) of the different sites samples were found within the permissible limit (1000mg/l) of WHO standards.

In addition to physico-chemical parameters the ultrasonic parameters such as density, ultrasonic velocity were also measured with the standard methods and adiabatic compressibility with acoustical impedance were calculated for the comparison with the physico-chemical parameters. The density of the sample lies nearer to 997 kg/m^3. The ultrasonic velocity of the samples from the two different sites is found to be varying from 1518 to 1522 m/s. the derived parameters adiabatic compressibility, acoustical impedance and intermolecular free length provides the molecular relationship and can be used to detect the interactions and also to find out how the molecules behaves with each other when the other elements are present in the liquid other than only its pure molecules. The compressibility of the samples obtained in the range of 4.32007 to 4.35803 X 10^{-10} m^2/N. The intermolecular free length is the quantity which depends upon the size of the molecule and is different for different surfaces the observed values are found to be 4.3479 and 4.3505 X 10^{-6} m. The acoustical impedance is another parameter which provides the measure of opposition offered by the molecules to the motion of the acoustic waves through the liquid. Here the values obtained for the acoustical impedance are 1511007 and 1520677 kg/m^{2}s. Any type of impurity/ pollutant in the liquid can be responsible for the occurrence of the change in the ultrasonic parameters.

Table 01: Different physic-chemical and ultrasonic parameters of water

Sr. no.	Parameters	WHO Standards (1993)	ISI: 10500-91 (1991)	Telangkhedi dam		
				Min	Max	Mean
1	**Color**					**Agreeable**
2	**Temperature**	--	--	32.4	34.5	**32.95**
3	**pH**	6.5-- 8.5	6.5—8.5	7.9	8.12	**8.01**
4	**TDS**	1000	500	149	155	**152**
5	**Hardness**		200-600	115	120	**125**
6	**Alkalinity**		200	124	126	**125**
7	**Chlorides**	250	250-1000	20	25	**22.5**
8	**Iron**		0.3	< 0.3	< 0.3	**< 0.3**
9	**Calcium**		75- 100	62	64	**6311111**
10	**Silica**		----	14	16	**15**
11	**Ultrasonic velocity**		-----	1518.6	1522.2	**1520.4**
12	**Density**		----	995	999	**997**
13	**Compressibility**		-----	4.32007 X 10^{-10}	4.35803 X 10^{-10}	**4.33905 X 10^{-10}**
14	**Inter mole free length**			4.34791 X 10^{-6}	4.35053 X 10^{-16}	**4.349227 X 10^{-10}**
15	**Acoustic Impedance**		----	1511007	1520677	**1518066**

Impinging solar radiation and the atmospheric temperature brings interesting spatial and temporal changes in natural waters.

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CONCLUSION

The study on the potability of local water bodies near the Saoner city was carried out. The major sources were located and the investigations of physico-chemical and ultrasonic parameters were carried out according to the

present norms. The water from all the samples are found to be having the pH, TDS, alkalinity, calcium, iron, nitrites, chlorides, silica etc. within the permissible limit of WHO.

The study was also carried out to find out any relation between the ultrasonic parameters and the physico-chemical parameters of the water so that the process of quality monitoring can be made easier. Here in this case the increase in the pH, TDS, calcium, chlorine and iron all can be related to the increase in the density and ultrasonic velocity, which tends to increase in acoustic impedance but the intermolecular free length and compressibility is observed to be decreasing. These observations of different samples does not conclude any specific relation between the TDS or calcium or chlorine contain in the sample with the ultrasonic parameters, but we can conclude that the increase in TDS or any solids in the water can be responsible for the increase in acoustical impedance because of increase in the ultrasonic velocity. The data collected here suggests the need of more study to be carried out on the interrelationship of the physico-chemical and ultrasonic parameters.

REFERENCES

[1] usharani, K; umarani, K; ayyasamy, P M; shanthi, K; lakshmanaperumalsamy, P, *J. Appl. Sci. Environ. Manage*. June **2010**, Vol. 14 (2) 29 – 35
[2] Patil. P.N, Sawant. D.V, Deshmukh., *Int. Journal of Environmental Sciences*, Volume 3, no 3, **2012**, 1194
[3] APHA, (**1998**). Standard methods for the examination of water and wastewater. 20th edition, American public health Association, American water works association, Water environment federation, Washington DC
[4] ICMR: Manual of standards of quality of drinking water supplies (**1975**)
[5] IS:10500. Indian standards of Drinking Water Specification, Bureau to Indian Standards (BIS),New Delhi, India (**1991**)
[6] ISI: Tolerance limit for inland surface water subject to pollution, 2296, Indian Standards Institute, New Delhi, India (**1982**)
[7] Mahajan, SV, Savita Khare, Shrivastava, VS (**2005**). *Indian J. Environ Protec* 25(3): 254-259
[8] Saxena, MM (**1994**). Environmental Analysis – water, soil and air. Agro Botanical Publishers (India), 2nd Edition, 4-86: 121-125
[9] World Health Organization (WHO), Guidelines for drinking water quality. World Health Organization, Geneva, Switzerland (**1993**)
[10] Standard Methods for the Examination of Water and Wastewater© Copyright **1999** by American Public Health Association, American Water Works Association, Water Environment Federation,
[11] On Water Quality Standards and Water Quality Indices, Priyanka Chugh, Amarjit Kaur, Harpreet Kaur, Satish Kumar and H.S. Sahota, International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064,
[12] Water Quality Analysis Laboratory Methods, Dr. (Mrs.) Leena Deshpande, National Environmental Engineering Research Institute (NEERI), Nagpur, Council of Scientific & Industrial Research, New Delhi, Govt. of India.