Investigation of Physiochemical Parameters of 'Well-Water' from Dhamangaon Rly Region, Amravati (M.H.)

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Abstract:

The quality of drinking water is important for the health. In view of significant health issues arising out of polluted water bodies, quality of the water must be tested for various contaminants. The nature of drinking water is affected by various factors which include chemical, physical and biological factors. The objective of this research is to provide information on the physicochemical and ecological parameters of well-water in Dhamangaon Rly.

The present study involves the analysis of water quality in terms of physico-chemical parameters such as conductance, pH, COD, DO, TS, TSS, Free CO_2 etc. of well-water in Dhamangaon Rlyregion.

Key words: Physico-chemical parameters, well-water, water pollution

1. Introduction:

Water is essential for existence of all kind of life on the earth but as a result of activities of human being and animals water is adversely affected and many unwanted and harmful substances enter into our atmosphere in other words water get polluted. This processes of pollution has been continuously taking place since the existence of life but now it has assume dangerous proportion due the population explosion and rapid growth of industries. The pollution present in the air in the industrial areas ultimately contaminates water of river, lake, spring etc. through rain.

The cause of water pollution is the discharge of domestic and industrial waste into different sources of water such as rivers, lakes, springs etc. If this waste is discharged on the land surface, it percolates down the earth surface and contaminates ground water.The disposal of industrial wastes is one of the major causes of water pollution. There are various industries such as those related to dairy product, distilleries of fruits and vegetable products, tanneries, textile, pulp and paper, drugs, organic, chemicals, explosive, pesticides, steel plants, fertilizer, oil refineries, thermal power plants, sugar mills etc. These industries produce a variety of pollutants such as carbon dioxide, carbon monoxide, sulphur dioxide, ammonia, organic matter of different kinds, colloidal material, suspended solids, acidic and basic substances, mineral oils, variety of inorganic substances, some toxic materials and heat which are discharged into the receiving water. Some of these pollutants are highly toxic. Hence water pollution is responsible for a large variety of diseases; polluted water affects irrigated land and leads to decline in fisheries. Due to rapid industrialization the availability of water is becoming increasingly difficult [1-2].

People have now become aware of the hazards of water pollution and steps are being taken to minimize it. The waste water flow from factories is analyzed and is subjected to suitable treatment before it is allow to be discharged in receiving water such as river or a lake so that it does not cause pollution [3-4].

In present study involves the analysis of water quality in terms of physico-chemical parameters of Dhamangaon Rly 'Well-Water' in Amravati District, Maharashtra.

2. Materials and Methods:

The water samples from Well-Water of Dhamangaon Rly were collected from ten different locationsin the morning hours between 9 to 11am, in polythene bottles. The water samples were immediately brought into the laboratory for the estimation of various physico-chemical parameters like pH by using pH Meter (Model: EQ 611) while other parameters such as DO, TDS, free CO_2, Hardness, Chlorides were estimated in the laboratory by using standard methods [5-7].

Experimental Details:

Sample collection

Drinking water samples were collected from different places in and around Dhamangaon Rly. The potable water samples were collected in cleaned plastic polyethylene bottles and brought in the laboratory with necessary precaution to avoid change in water quality. Before the sampling, all the bottles were washed and rinsed thoroughly with distilled water. Standard methods were followed for sample collection and preservation.

Determination of physico-chemical parameters of water

Determination of pH: The pH of each water sample was measured using pH Meter (Model: EQ 611).

Determination of Total Dissolved Solid (TDS):

Total dissolved solids are determined as the residue left after evaporation of the filter paper. For TDS, an evaporating dish of suitable size was taken and weighed. 250-500 ml filtered sample was evaporated in the dish on a water bath. Finally, the TDS was calculated as follows.

$$TDS\ (mg/l) = A - B\ x\ 100/V$$

Where, A = Final weight of the dish in mg,
B= Initial weight of the dish in mg,
V = Volume of sample taken in ml.

Determination of chloride ion:

For chloride ion determination, silver nitrate method was used. 50 ml was sample was taken in an Erlenmeyer flask and added 2 ml of potassium chromate solution. It was then titrated against 0.02N silver nitrate until a persistent red tinge appeared. Finally chloride, mg/l was calculated.

$$Chloride(mg/l) = (ml\ x\ N)of\ AgNO3\ x\ 1000\ x\ 35.5\ ml\ sample$$

Determination of total hardness of water:

To determine the total hardness of water samples 50mL of water sample was taken in a washed conical flask. 1 ml buffer solution and 2-3 drops of Eriochrome Black-T indicator were added, the color of the solution turns wine red. This solution was titrated against standardized EDTA solution until the color changes from wine red to sky blue which indicated the end point. The final reading of the burette was noted and the titration was repeated to get constant value. Finally using the analytical calculation, total hardness of water sample was determined in terms of mg/L of $CaCO_3$.

Sample and their location (Well-Water)

Sample No.	Location (nearby towns of Dhamangaon Rly)
Water Sample 1	Dhamangaon Rly city
Water Sample 2	Dattapur Dhamangaon

Water Sample 3	Juna Dhamangaon
Water Sample 4	Ashok Nagar
Water Sample 5	Aasegaon
Water Sample 6	Ramgaon
Water Sample 7	Parsodi
Water Sample 8	Hingangaon
Water Sample 9	Bhilli
Water Sample 10	Gunji

3. Results and Discussion:-

The physico-chemical parameters of water samples from ten different locations are presented in Table.

Sample No.	pH	Conductivity (ms)	TDS (mg/l)	Free CO_2 (mg/l)	DO (mg/l)	Chloride (mg/l)
Water Sample 1	7.12	0.942×10^{-3}	860	61.6	10	36.8
Water Sample 2	7.16	0.615×10^{-3}	640	35.2	8.5	48.2
Water Sample 3	7.50	0.755×10^{-3}	660	44.0	12	54.2
Water Sample 4	7.95	1.280×10^{-3}	1120	70.4	16	56.7
Water Sample 5	7.25	1.079×10^{-3}	820	61.6	15.3	60.2
Water Sample 6	7.60	0.702×10^{-3}	640	44.0	12.2	59.6
Water Sample 7	7.55	0.693×10^{-3}	680	26.4	13.0	35.2
Water Sample 8	7.45	0.722×10^{-3}	660	44.0	11.5	40.9
Water Sample 9	7.85	0.612×10^{-3}	620	35.2	8.8	38.9
Water Sample 10	7.77	0.603×10^{-3}	580	35.2	9.5	45.2

pH

The pH was alkaline values ranges from 7.12 to 7.95. The maximum pH value (7.95) was recorded for the water sample number 4. The factors like air temperature bring about changes the pH of water. Most of bio-chemical and chemical reactions are influenced by the pH. The reduced rate of photosynthetic activities reduces the assimilation of carbon dioxide and bicarbonates which are ultimately responsible for increase in pH [8].

Electrical conductivity:

Electrical conductivity (EC) is the ability of an aqueous solution to conduct the electric current. Electrical Conductivity is a useful tool to evaluate the purity of water [9]. The most desirable limit of EC in drinking water is prescribed as 1.5×10^{-3} ms. The source of EC may be an abundance of dissolved salts due to poor irrigation management, minerals from rain water runoff, or other discharges. Electrical conductivity ranged from 0.603×10^{-3} - 1.280×10^{-3} ms in the study area.

Total dissolved solids:

Total dissolved solids (TDS) denote mainly the various kinds of minerals present in water. The permissible value recommended for TDS is 500 mg/l prescribed by IS 10500 and BIS, FAO. TDS ranged from 580-1120 mg/l. The present study observed well water samples having low TDS which indicates the water is less mineralized and comparatively with lesser pollutants.

Free Carbon dioxide:

The value of free CO_2 ranges from 26.4 mg/l to70.4 mg/l. The maximum value (70.4 mg/l) was recorded for sample number 4 and minimum value (26.4 mg/l) for sample number 7. This may be depends upon alkalinity and hardness of water body.

Dissolved oxygen:

The presence of dissolved oxygen is essential to maintain the higher forms of biological life and to keep proper balance of various pollutions thus making the water bodies healthy. The chemical and biochemical process undergoing in water body are largely dependent upon the presence of oxygen. Estimation of dissolved oxygen is a key test in water pollution and waste treatment process control. The permissible value recommended for DO is 5mg/L as per Indian standard. In the present investigation dissolved oxygen ranged from 8.5– 16.0 mg/l. Most of the well water in the study area showed high DO which may be due to the increased solubility of oxygen at lower temperature.

Chlorides:

The chloride concentration indicates the sewage pollution. Atmospheric sources or sea water contamination is reason of the chloride concentration in ground water. Soil Porosity also plays a key role to increase chlorides concentration. In study, the results the values of chlorides range from 35.2 mg/l to 60.2 mg/l. The maximum value (60.2 mg/l) was recorded for sample number 5 and minimum value (35.2mg/l) for sample number 7.

4. Conclusion

The outcome of the study helps us to develop a water quality awareness culture. Water provides a unique medium to many physical, chemical and biochemical reactions. Any minute change in water quality parameter may adversely and favorably affect the particular reaction as well as whole ecosystem. The study is very useful to Public Health Department and Municipal Corporation to improve public health in epidemiological issues.

In the present study the collected drinking water samples of well-water of Dhamangaon Rly. were analyzed for physicochemical parameters of pH, TDS, free CO_2, DO, Cl^- and the result revealed that almost all the measured parameters were within the standard drinking water quality given by WHO, BIS and US-EPA. Overall the present investigation found that the maximum parameters were not at a level of pollution and may not cause harmful effect to the consumers.

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6. References:

1. Sanchez E., Colmenarejo M. F., Vicente J., RubioA., García L., and Borja R., Use of the Water Quality Index and Dissolved Oxygen Deficit as Simple Indicators of Watershed Pollution., *Ecological Indicators*, 2007, 7(2): 315-328.
2. BordaloA. A.,Teixeira R., and Wiebe W. J.,A Water Quality Index Applied to an International Shared River Basin: The Case of Douro River.,*Environmental Management*, 2006, 38(6): 910-920.
3. Pandey A. K., Siddiqi S. Z., and Rama Rao, Physico-chemical and biological characteristics of Husain sagar, an industrially polluted lake, Hyderabad. *Proc. Acad. Environ. Biol.*,1993, 2(2), 161-167.

4. Masood Ahmed and Krishnamurthy R., Hydrobiological studies of Wohar reservoir Aurangabad(Maharashtra state),*India. J. Environ. Biol.,* 1990, 11(3), 335- 343.

5. APHA, Standard Methods For Examination of Water and Wastewater, 20th Edition, American Public Health Association, Washington D. C.,1985.

6. Trivedy R. K., and Goel P. K.,Chemical and biological methods for water pollution studies, Environmental Publication, Karad, Maharashtra, 1986.

7. Kodarkar M. S., Methodology for water analysis, physico-chemical, Biological and Microbiological IndianAssociation of Aquatic Biologists Hyderbad; 1992, Pub.2: pp. 50.

8. Kamble S. M.., Kamble A. H., and Narke S. Y., Study of physico-chemical parameters of Ruti dam, Tq. Ashti, Dist. Beed, Maharashtra. *J. Aqua. Biol.*2009, 24(2): 86-89.

9. AcharyaG. D.,Hathi M. V., Patel A. D., and Parmar K. C.,Chemical properties of groundwater in BhilodaTaluka Region, North Gujarat. *India. E-Journal of Chemistry*, 2008, 5(4): 792-796.