

Assessment of Drinking Water Quality and Its Impact on AmbiVillage Resident's Health

¹Dr. Renu Parashar,²Dr. UshadeviPatil

¹Assistant Professor,²Professor

¹First Year Engineering Department, DYPIET, Ambi, SPPU Pune, India

²Civil Engineering Department, D. Y. Patil Institute of Technology, Pimpri, SPPU Pune, India

Abstract

The present study was undertaken to study the physico-chemical parameters of water samples collected from Indrayani river water at ambi Village Pune. The quality of water is of vital concern for the mankind since it is directly linked with human welfare. This water used for drinking purpose without treatment in village Ambi, Pune. The water sample was collected from different places of Ambi Village. The physicochemical parameter like, temperature, pH, total dissolved solids (TDS), turbidity, total alkalinity (TA), total hardness (TH), calcium (Ca++) magnesium (Mg++), chloride (Cl-), was determined. The analysis concludes that the water of Ambi village is hard water which contains higher amount of Calcium and Magnesium as well as the water contains higher amount of carbonates and bicarbonates.

IndexTerms - CpH, Total Hardness, Total Alkalinity, Turbidity, Indrayani River

I. INTRODUCTION

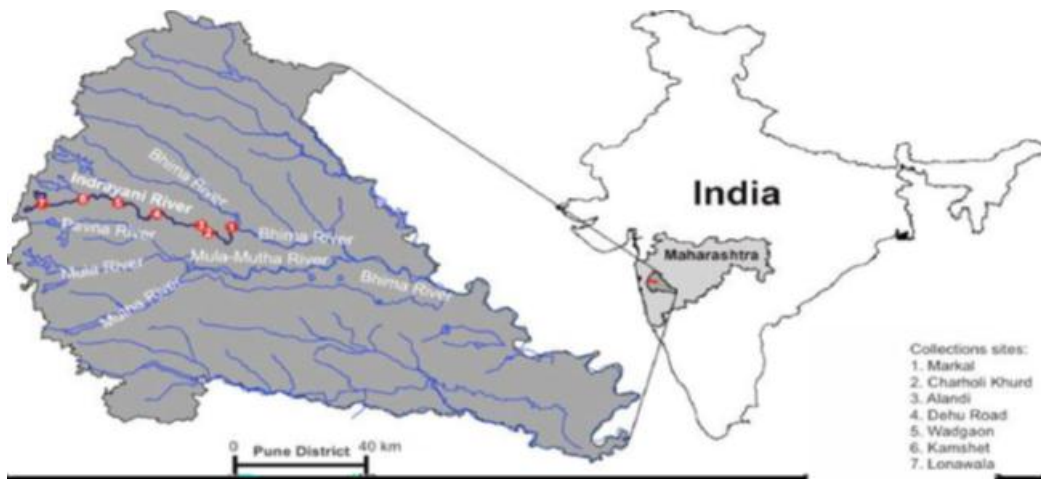
Water is very essential part of all living organisms. Now days no any source of pure, healthy and safe water is available. Safe drinking water is a basic need for good health and it is also a basic right of humans. River pollution has become a threat these days. Even the most prestigious and sacred rivers of India have been facing the curse of pollution for a long time. Increase in urbanization, industrialization, agriculture activity and various human activities has increase the pollution of surface water & ground water. Water should be free from the various contaminations viz. Organic and Inorganic pollutants, Heavy metals, Pesticides etc. as well as all its parameter like pH, Total Hardness, Electrical Conductivity, Total Alkalinity, Calcium, Magnesium, Carbonate, Bicarbonate, Chloride, Total Dissolved Solid, Sodium Potassium, Nitrate, DO should be within a permissible limit according to WHO. The drinking water should be analyzed regularly because it affects human health and caused various water borne diseases. The present study of physico-chemical parameters of drinking water involves analysis of various characteristics of Indrayani river water.

II. EXPERIMENTAL SECTION

The Indrayani River originates in Kurvande village near Lonavla, a hill station in the Sahyadri Mountains of Maharashtra. Fed by rain, it flows east from there to meet the Bhimariver, through the Hindu pilgrimage centers of Dehu and Alandi. It follows a course mostly north of the city of Pune. It is revered as a holy river and is associated with such figures such as SantTukaram and Dnyaneshwar. Indrayani River has cultural importance. The Indrayani River in Pune district of Maharashtra is a connective river to Bhimariver and has long been considered as a dynamic river due to frequent changes in its course.

Ambi village is located in Mawal Tehsil of Pune district in Maharashtra, India. It is situated 80km away from sub-district headquarter Vadgaon and 26km away from district headquarter Pune. As per 2009 stats, Ambi village is also a gram panchayat. The total geographical area of village is 819 hectares. Ambi has a total population of 2,328 peoples. There are about 473 houses in Ambi village. TalegaonDabhade is nearest town to Ambi which is approximately 3km away.

The drinking water supplied to peoples of Ambi village is the untreated surface water of Indrayani River, but this supply is insufficient, so the peoples using water from another source like ground water of well or bore well. This water mainly used for drinking, household purpose, for animals and for farming. Ground water is the surface water that has passed slowly through soil, rocks into the earth. It is best source of drinking water. Percolation of ground water in the earth is very slow process. During percolation different pollutants, suspended particles and harmful bacteria are removed. This naturally purified water is of good quality for drinking purpose. During percolation Ca, Mg, Fe, Na, K like heavy metal ions, carbonates, bicarbonates, various anions like Cl⁻, NO₃⁻, SO₄²⁻, and various gases like H₂, O₂, H₂S, NH₃, Cl₂ can be dissolved in water.



III. METHOD

The ground water of different areas of Ambi village was collected in Aug 2016. The water samples are of open well and bore well source. The samples were collected in high density polyethylene and glass containers. The containers were rinsed twice by the same water sample and then the water sample filled in it. The water samples were analyzed for Colour, Temperature, pH, Electrical Conductivity (EC), Total Dissolved Solid (TDS), Total Alkalinity, Calcium (Ca), Magnesium (Mg), Bicarbonate, Total Hardness (TH), Chloride, Carbonate, nitrates and Sulphates using standard techniques. A.R. grade reagents were used for preparation of all solutions. Measurement of various physico-chemical parameters were carried out as in Standard methods given by the APHA.

IV. EFFECTS OF CONTAMINATED WATER ON HEALTH

The water samples analyzed are hard water. These water samples contain heavy metals along with carbonates and bicarbonates. Hardness causing metal ions combines with different anions and forms Calcium carbonate, Magnesium carbonate, Magnesium hydroxide, Calcium Sulphate and Ferrous chloride etc. hard water mainly causes different water born diseases. Presence of excessive Calcium carbonate in drinking water causes gastrointestinal, hyperacidity, constipation and diarrhea. Calcium carbonate for long period of time can harm kidney by increasing risk of kidney stones. Problem of dry skin, loss of hair can be causes due to use of hard water for long time. Hard water forms scum with soap and detergent which decreases cleaning ability of soap. Deposition of scales takes place in hard water containers or pots and on water heaters. Alkalinity of water causes nutritional imbalance, allergies, metabsorption and poor digestion of food in stomach.

Table 1: Physico-chemical parameters for water of Ambi village

Sr No.	Parameters	Standards Values as per IS:10500 : 2004	01 Sample	02 Sample	03 Sample	04 Sample	05 Sample	06 Sample	07 Sample	08 Sample	09 Sample	10 Sample
1	Odour	unobjectionable	None	None	None	None	None	None	None	None	None	None
2	Colour	5-25	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
3	Temperature	Acceptable	30oC	30oC	30oC	30oC	30oC	30oC	30oC	30oC	30oC	30oC
4	Turbidity	5-10	0.50	0.51	0.45	0.49	0.5	0.53	0.49	0.48	0.5	0.52
5	pH	6.5-8.5	7.36	7.38	7.30	7.35	7.19	7.62	7.27	7.34	6.77	7.23
6	Electrical Conductivity	200-600	221	220	251	218	173	145	168	210	445	254
7	Total Dissolved Solids	500-2000	789	808	1088	1052	933	778	850	1205	1367	892
8	Total Alkalinity	200-600	647	740	840	780	1020	720	820	800	880	780
9	Total Hardness in terms of CaCO ₃	300-600	1246	1248	1728	1734	1472	1184	1312	1632	1792	1440
10	Sulphate	200-400	27.8	26.9	36.3	23.5	32.1	22.2	28.5	33.8	39	31.4
11	Nitrates	45-100	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3

12	Chloride	250-1000	28.8	24.1	38.5	30.4	32.4	20.8	29.1	35.3	42.1	31
13	Total Coliform	Nil-10	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil

V. RESULT AND DISCUSSION

The water samples analyzed for physico-chemical parameters of ground water i.e. well and bore well water in Aug 2016 presented in Table 1 conclude that:

The pH level is a measure of the acid content of the water. The pH level has profound effect on all body chemistry, health and disease. pH of water beyond permissible range can affect mucous membrane of cells and cause corrosiveness in water supply system. The pH values of water sample ranges in between 6 to 8 against the standards of WHO and IS 10500:2004.

The turbidity of ground water samples were obtained after analysis of water samples has values from 0.4 to 0.5 NTU. All determined values of water samples show very less values of turbidity than permissible values of WHO.

The electrical conductivity of groundwater samples which was analyzed for physico-chemical parameters was found in the range of 100-500 $\mu\text{mhos/cm}$. This measured values of electrical conductivity less than WHO standards. The ground water sample 09 and 06 are showing higher and lower values of conductivity in the collected water samples respectively.

The major sources of hardness in water are dissolved calcium and magnesium ions from sedimentary rocks whereas minor contribution to the hardness of water is made by ions of aluminum, barium, manganese, iron, zinc etc. The total hardness of water represents primarily the total concentration of Ca^{2+} and Mg^{2+} ions in terms of CaCO_3 . The analyzed water samples contain total hardness within the range 1000 to 2000 mg/l. Water sample 09 has highest hardness i.e. 1792 mg/l.

Presence of Calcium and Magnesium mainly causes hardness in water. Hard water which contains hardness above 200 ppm not useful for drinking purpose. The water samples analyzed here was hard water since hardness of all the samples is above 1000 mg/l.

The Total Alkalinity of water represents presence of carbonates, bicarbonates and hydroxides. All studied water samples does not contain Phenolphthalein alkalinity. Total alkalinity of analyzed ground water ranges from 700 to 1000 mg/l, which is above the permissible limit. This results shows that all water samples contains maximum amount of carbonates in water.

The studied water sample contains very less amounts of Chlorides, Sulphates and Nitrates than permissible values of WHO.

No any type of bacteria i.e. total coli form and E.coli was detected in 100ml of all water samples.

The results of analysis show that the water samples collected from different ground water sources of Ambi village were polluted. It contains high amount of hardness and alkalinity causing ions. This water should be treated before using it as drinking water.

VI. CONCLUSION

It was concluded that the drinking water of villages of Ambi is not potable. To maintain quality of groundwater, continuous monitoring of physicochemical parameters should be check. Then that water can be used for cooking and drinking only after proper treatment.

VII. ACKNOWLEDGEMENT

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REFERENCES

- [1]. **B.I.S.** Bureau of Indian Standards Drinking water specification, 11th revision, IS: 10500 (2004).
- [2]. **WHO** Guideline for drinking Water Quality; WHO/SDE/WSH/03.04/09/Rev/
- [3]. **APHA, AWWA, WEF**, "Standard methods for the examination of water and waste water", (20th edn.) American Public Health Association (1998), Washington D.C.
- [4]. **DattatrayaBharti**, Isub Ali Sayyad, G. Gaikwad, D.R. Taikar and J. Dhore "Physico-Chemical Characteristics of bore well water quality in Nagpur region(South zone)" J.Chem.Pharm.Res.;2011,3(2):922-927
- [5]. **P.Jain, J.D.Sharma**, D.Sohu and P.Sharma "Chemical analysis of drinking water of villages of Sanganer Tehsil, Jaipur District" Int.J.Environ.Sci.Tech.©Winter 2006,Vol.2,No.4,pp.373-379
- [6]. **Rajesh Kumar**, NeerjaKalra, S.S.Yadav and R.T.Singh "Physico-chemical analysis of ground water taken from five blocks of southern Bhojpur(Bihar)", J. Chem.Pharm.Res.;2012,4(3):1827-1832 BasavarajaSimp, S.M.Hiremath,KNS Murthy, K.N.Chandrashekarappa, "Analysis of Water Quality Using Physico-Chemical Parameters Hosahalli Tank in Shimoga District, Karnataka, India", Global J.Sci. Fron.Res.,Vol.11 Issue3 Version 1.0 May 2011
- [7]. **S.A.Manjare**, S.A.Vhanalakar and D.V.Muley, "Analysis of water quality using physico-chemical parameters of Tamdalge tank in Kolhapur district, Maharashtra", Int. J. Adv. Biotech. Res.", Vol.1, Issue 2, Dec 2010, pp 115-119