



STUDY OF PHYSICO-CHEMICAL PARAMETERS AND PRESENCE OF HEAVY METALS IN BORE WELL WATER AT HIMALAYA VISHWA RESIDENTIAL AREA WARDHA

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ABSTRACT

The present work deals with physico chemical analysis of Characteristics of Bore wells at Himalaya- Vishwa Residential Area Wardha. The physico chemical test were conducted employing standard scientific methods like conductivity, colorimetry, pH metry, heavy metal analysis etc, so as to minimize the determinate errors. Assessment of the water sample values s made by the comparison of the assessed values of all the physico- chemical parameters with the corresponding standards for drinking water by World health organization, Bureau of Indian standards BIS.

Key words: Physico-chemical properties, pH metry, WHO, BIS.

INTRODUCTION

It is well known fact that clean water is absolutely essential for healthy living. Many areas of ground water and surface water are now contaminated with heavy metals, persistent organic pollutants and nutrients that can adverse effect on health¹⁻⁴. Contamination of water can cause water borne diseases^{5,6}.

Physico chemical analysis is of prime importance to access the quality of water for its cost usage like drinking, bathing, fishing, industrial processing etc⁷, and to get idea about pollution load of domestic sewage and industrial wastes on receiving water bodies. Quantitative analytical procedures can be done by gravimetric, volumetric and colorimetric estimations.

EXPERIMENTAL

Sampling-for Chemical analysis, the water samples are collected from different regions, at depth of 0.5 meter in case of open water bodies and in case of piped water supply system from the tap in the thoroughly cleaned jar or natural gas container of minimum 2.5 lit of capacity provided with double cap device. The samples are collected up to top without living any space so as to prevent the premature release of dissolved gases during the transit period.

For Bacteriological analysis The water samples are collected from 30 cm depth in case of open water bodies and for public hydrates after sterilizing the tap for few minutes with the help of spirit lamp prior to taking sample in properly sterilized bottle (120 mL capacity). All the containers are rinsed with chromic acid solution, followed by tap water and distilled water⁸.

Physico-chemical analysis

Physico chemical analysis of water include.

- (i) Mineral analysis-comprising physical, parameters and significant cations and anions.
- (ii) Demand analysis-including biological oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO), and total organic carbon (TOC).
- (iii) Nutrient analysis-consisting analysis of different forms of nitrogen & phosphorus.
- (iv) Trace determinants including metal analysis, organic analysis and pesticide analysis⁹.

RESULTS AND DISCUSSION

Physico-chemical analysis

The results of Physico-chemical Analysis are as reported in Table 1 & 2. The Indian standard and the WHO standard for physical appearance, odour and test agreeable. In the present study the water samples shows colourless, odourless & agreeable and hence water can be considered for human consumption.¹⁰

Turbidity

Turbidity values are well within limits. The pH values ranges from 7.1 to 7.8 which are well with the limits. The TDS value recommended by BIS & WHO are 500. TDS values are found higher for samples 1,2,3,4,5 & 9 and these samples are unfit for human consumption.

Conductivity

The specific conductance ranged from 56 to 180 $\mu\text{s}/\text{cm}$. It shows that water has very low electrical conductivity implying the presence of reduced ion species.

Concentration of chloride ions

Concentration of Chloride ions variation between 82 mg/lit to 180 mg/lit. In all the samples the amount of chloride ions is within the limiting values indicating lesser degree of pollution.

Nitrate and nitrite

Nitrate and Nitrite observed in samples are below prescribed range.

Total hardness

The excessive limit of total hardness is 300 mg/L. Samples with code no. 5,7,8,9. The total hardness values exceeds the limit, hence water from those bore-wells are unfit for drinking. The hardness may be due to addition of calcium and magnesium by soap washings and water can be used for general purposes.

Alkalinity

The values of alkalinity are found to be higher than the prescribed range and therefore water is unsafe for drinking but can be used after proper treatment.

Table 1: Chemical analysis of few water samples from different sites of Himalaya wishwa area

Code	Nitrites as NO ₃	Nitrites as N	Total hardness	alkalinity	Iron as Fe	Fluoride as F	Calcium	Magnesium	Arsenic	Lead	Cadmium	Mercury
1	1.5	Nil	292	246	0.06	0.45	157	97	.01	.03	Nil	Nil
2	1.2	Nil	300	255	0.05	0.41	158	69	.005	.001	.003	Nil
3	1.3	Nil	285	241	0.04	0.44	159	65	.012	.005	Nil	Nil
4	1.1	Nil	295	238	0.05	0.40	151	61	.02	.01	.001	Nil
5	2.0	Nil	310	252	0.05	0.35	152	58	.013	.01	.002	Nil
6	2.0	Nil	305	246	0.06	0.31	150	59	.02	.015	Nil	Nil
7	3.01	Nil	310	239	0.07	0.29	153	66	.01	.019	.009	Nil
8	3.02	Nil	320	261	0.06	0.27	151	82	.021	.02	.007	Nil
9	3.0	Nil	358	264	0.07	0.65	150	89	.023	.03	Nil	Nil

Table 2: Water quality parameters from different sites of Himalaya wishwa area

Code	Physical appearance	Odour	Taste	Turbidity	pH	TDS	Conductivity $\mu\text{s/cm}$	Chloride ions
1	Colourless	Odourless	Agreeable	1	7.7	520	58	98
2	Colourless	Odourless	Agreeable	1.1	7.5	540	70	180
3	Colourless	Odourless	Agreeable	1.0	7.2	530	75	93
4	Colourless	Odourless	Agreeable	1.12	7.7	510	71	99
5	Colourless	Odourless	Agreeable	1.5	7.8	530	56	170
6	Colourless	Odourless	Agreeable	1.6	7.3	490	59	87
7	Colourless	Odourless	Agreeable	1.3	7.1	495	73	86
8	Colourless	Odourless	Agreeable	1.4	7.2	498	77	82
9	Colourless	Odourless	Agreeable	1.0	7.25	510	80	89

Iron

Iron as Fe found ranging from 0.04 to 0.07 which is well within the limit prescribed & hence water becomes fit for consumption.

Fluoride

The value of fluoride content shows a value between 0.27 to 0.65 mg/lit. which is well within the limit. It does not causes any dental carries and danger of fluorosis.

Calcium

The value prescribed for Ca is 75-200 which is well acceptable within the limits.

Magnesium

The value of magnesium varies in the range 58 to 97 mg/L which is tolerable.

The values of all 18 parameters measured for 9 water samples are far low in many cases, which indicate pollution free nature of ground water in this region and can be used for drinking purposes only after proper disinfection and hence these samples are potable.

Heavy metals analysis

Arsenic – Arsenic observed in the samples are below prescribed range.

Lead – The value of lead in the various sample are found to be within limit.

Cadmium – Values of cadmium in the samples wit code no. 1, 3, 6 & 9 are nil, while in rest of the samples value is within limit.

Mercury – Mercury is totally absent in all the samples.

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