AN EVALUATION OF PHYSICO-CHEMICAL PARAMETERS OF TUBEWELL WATER FROM DEVRUKH CITY, M.S. INDIA

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Abstract

Natural water contaminates due to weathering of rocks and leaching of soils, mining processing etc. It is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varied water borne diseases. The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. It is necessary to know details about different physico-chemical parameters such as color, temperature, acidity, hardness, pH, sulphate, chloride, DO, COD, used for testing of water quality. Some water analysis reports of devrukh city with physic-chemical parameters have been studied and reported.

Key words- Water, temperature,pH, hardness, sulphate, DO,COD.

I. Introduction

Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth. As of now only earth is the planet having about 70 % of water. But due to increased human population, industrialization, use of fertilizers in the agriculture and man-made activity it is highly polluted with different harmful contaminants. Therefore it is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varied of water borne diseases. It is difficult to understand the biological phenomenon fully because the chemistry of water revels much about the metabolism of the ecosystem and explain the general hydro - biological relationship.

The availability of good quality water is an indispensable feature for preventing diseases and improving quality of life. Natural water contains different types of impurities are introduced in to aquatic system by different ways such as weathering of rocks and leaching of soils, dissolution of aerosol particles from the atmosphere and from several human activities, including mining, processing and the use of metal based materials The increased use of metal-based fertilizer in agricultural revolution of the government could result in continued rise in concentration of metal pollutions in fresh water reservoir due to the water run-off. Also faucal pollution of drinking water causes water born disease which has led to the death of millions of people.

People on globe are under tremendous threat due to undesired changes in the physical, chemical and biological characteristics of air, water and soil. These are related to animal and plants and finally affecting on it. Industrial development results in the generation of industrial effluents, and if untreated results in water, sediment and soil pollution.

Having mainly excessive amounts of heavy metals such as Pb, Cr and Fe, as well as heavy metals from industrial processes are of special concern because they produce water or chronic poisoning in aquatic animals. High levels of pollutants mainly org anic matter in river water cause an increase in biological oxygen demand, chemical oxygen demand, total dissolved solids, total suspended solids and fecal coli form.   They make water unsuitable for drinking, irrigation or any other use[1-4].

There are trends in developing countries to use sewage effluent as fertilizer has gained much importance as it is considered a source of organic matter and plant nutrients and serves as good fertilizer. Farmers are mainly interested in general benefits, like increased agriculture production, low cost water source, effective way of effluent disposal, source of nutrients, organic matter etc, but are not well aware of its harmful effects like heavy metal contamination of soils, crops and quality problems related to health. Research has proven that long term use of this sewage effluent for irrigation contaminates soil and crops to such an extent that it becomes toxic to plants and causes deterioration of soil (Quinn 1978, Hemkes1980). This contains considerable amount of potentially harmful substances including soluble salts and heavy metals like Fe^{2+}, Cu^{2+}, Zn^{2+}, Mn^{2+}, Ni^{2+}, Pb^{2+}.

The quality of ground water depends on various chemical constituents and their concentration, which are mostly derived from the geological data of the particular region. Industrial waste and the municipal solid waste have emerged as one of the leading cause of pollution of surface and ground water. In many parts of the country available water is rendered non-potable because of the presence of heavy metal in excess[5]. The situation gets worsened during the summer season due to water scarcity and rain water discharge. Contamination of water resources available for household and drinking purposes with heavy elements, metal ions and harmful microorganisms is one of the serious major health problems. The recent research in Haryana (India) concluded that it is the high rate of exploration then its recharging, inappropriate dumping of solid and liquid wastes, lack of strict enforcement of law and loose governance are the cause of deterioration of ground water quality[6-7]. Most of the rivers in the urban areas of the developing countries are the ends of effluents discharged from the industries. African countries and Asian countries experiencing rapid industrial growth and this is making environmental conservation a difficult task. Sea water contains large number of trace metals in very small concentration. Additions of these heavy metals are undesirable. Plants can accumulate heavy metals in their tissues in concentrations above the permitted levels which is considered to represent a threat to the life of humans, and animals feeding on these crops and may lead to contamination of food chain, as observed that soil and plants contained many toxic metals, that received irrigation water mixed with industrial effluent .

II. Materials and Methods

Collection of Sample

Total 12 sample tube well water samples were collected from devrukh city in February – march 2019 .The water sample werebrought to laboratory for analysis by pretreated plastic container with water and acetone . 24 hours of sampling time were used for the analysis.

III. RESULTS AND DISCUSSION

Physico- Chemical Parameters

It is very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purpose. Water must be tested with different physico-chemical parameters. Selection of parameters for testing of water is solely depends upon for what purpose we are going to use that water and to what extent we need its quality and purity. Water contains different types of floating, dissolved, suspended and microbiological as well as bacteriological impurities. Some physical test should be performed for testing of its physical appearance such as temperature, color, odour, pH, turbidity, TDS etc, while chemical tests should be perform for its BOD, COD, dissolved oxygen, alkalinity, hardness and other characters. For obtaining more and more quality and purity water, it should be tested for its trace metal, heavy metal contents and organic i.e. pesticide residue[8-9]. It is obvious that drinking water should pass these entire tests and it should content required amount of mineral level. Only in the developed countries all these criteria's are strictly monitored. Due to very low concentration of heavy metal and organic pesticide impurities present in water it need highly sophisticated analytical instruments and well trained manpower. Following different physical chemical parameters are tested regularly for monitoring quality of water.

Temperature

In an established system the water temperature controls the rate of all chemical reactions, and affects fish growth, reproduction and immunity. Drastic temperature changes can be fatal to fish.

pH

pH is most important in determining the corrosive nature of water. Lower the pH value higher is the corrosive nature of water. pH was positively correlated with electrical conductance . The reduced rate of photosynthetic activity the assimilation of carbon dioxide and bicarbonates which are ultimately responsible for increase in pH, the low oxygen values coincided with high temperature during the summer month. Various factors bring about changes the pH of water. The higher pH values observed suggests that carbon dioxide, carbonate-bicarbonate equilibrium is affected more due to change in physico-chemical condition [10].

EC (Electrical Conductivity)

Conductivity shows significant correlation with ten parameters such as temperature , pH value , alkalinity , total hardness , calcium) suggested that the underground drinking water quality of study area can be checked effectively by controlling conductivity of water and this may also be applied to water quality management of other study areas. It is measured with the help of EC meter which measures the resistance offered by the water between two platinized electrodes. The instrument is standardized with known values of conductance observed with standard KCl solution.

Dissolved Oxygen

DO is one of the most important parameter. Its correlation with water body gives direct and indirect information e.g. bacterial activity, photosynthesis, availability of nutrients, stratification . In the progress of summer, dissolved oxygen decreased due to increase in temperature and also due to increased microbial activity. The high DO in summer is due to increase in temperature and duration of bright sunlight has influence on the % of soluble gases (O^2 & CO^2). During summer the long days and intense sunlight seem to accelerate photosynthesis by phytoplankton, utilizing CO_2 and giving off oxygen. This possibly accounts for the greater qualities of O_2 recorded during summer . DO in sample is measured titrimetrically by Winkler's method after 5 days incubation at 293 K. The difference in initial and final DO gives the amount of oxygen consumed by the bacteria during this period. This procedure needs special BOD bottles which seal the inside environment from atmospheric oxygen.

Magnesium

It is also measured by complexometric titration with standard solution of EDTA using Eriochrome black T as indicator under the buffer conditions of pH 10.0. The buffer solution is made from Ammonium Chloride and Ammonium Hydroxide. The solution resists the pH variations during titration.

Sodium

It is measured with the help of flame photometer. The instrument is standardized with the known concentration of sodium ion (1 to 100 mg/litre). The samples having higher concentration are suitably diluted with distilled water and the dilution factor is applied to the observed values.

Potassium

It is also measured with the help of flame photometer. The instrument is standardized with known concentration of potassium solution, in the range of 1 mg to 5 mg/litre. The sample having higher concentration is suitably diluted with distilled water and the dilution factor is applied to the observed values[11].

| Sr. No.	Location	Sample	Temp °c	pH	E.C.	Total HardNess mg	Ca Hardness	Mg Hardness	Na	K
1.	Sahyandri Nagar	1	25.0	4.2	380	137	128	9.7	5.4	1.7
2.	Mhadik stop	2	25.0	5.2	410	146	112	34	2.7	0.0
3.	Panchyat Samiti	3	25.0	4.5	200	192	96	98	6.9	0.1
4.	Datta nagar	4	25.0	4.8	450	240	192	97	6.5	0.2
5.	Decad College	5	25.0	5.3	190	132	98	36	3.8	0.9
6.	Matrumandir Chauk	6	25.0	7.5	210	93	64	29	3.2	0.1
7.	Khake corner	7	25.0	5.8	450	205	92	26	3.2	-
8.	Padhye highschool	8	25.0	4.9	210	93	168	49	2.9	-
9.	ASP college	9	25.0	6.2	210	133	112	21	2.7	-
10.	Varchi aali	10	25.0	6.2	321	184	96	50	3.7	-
11.	Kangiwara	11	25.0	5.35	200	68	20	148	4.5	-
12.	ASP college 2	12	25.0	6.3	337	117	64	53	2.9	-
13.	Keshav shrushti	13	25.0	5.2	120	118	92	26	1.2	-
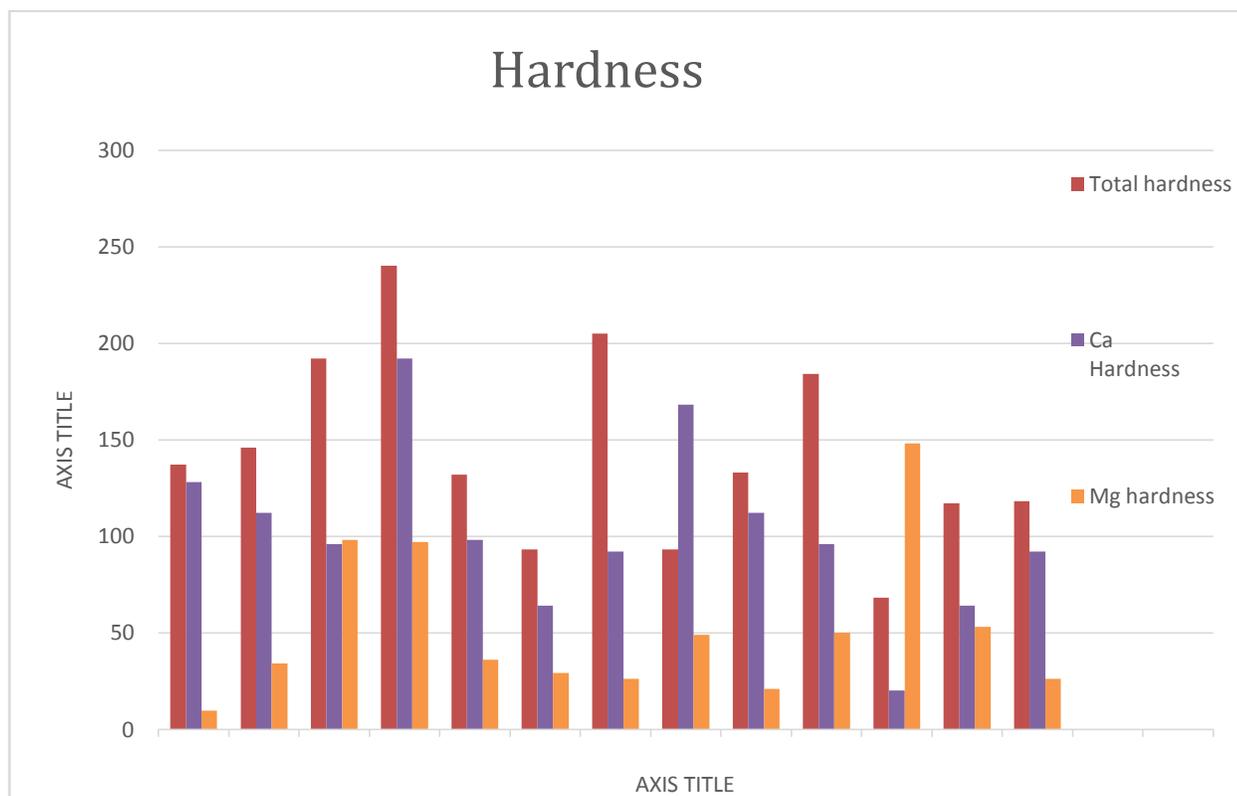
Table 1: ANALYSIS OF WATER QUALITY USING PHYSICO-CHEMICAL PARAMETERS TAMDALGE TANK IN KOLHAPUR DISTRICT, MAHARASHTRA.

Sr.No.	Parameter	Source of occurrence	Potential health effect
01	Turbidity	Soil runoff	Higher level of turbidity are associated with disease causing bacteria's.
02	Color	Due to presence of dissolved salts	-
03	Odor	Due to biological degradation.	Bad odor unpleasant
04	Electrical conductivity	Due to different dissolved solids.	Conductivity due to ionizable ions. High conductivity increases corrosive nature of water.
05	pH	pH is changed due to different dissolved gases and solids.	Affects mucous membrane; bitter taste; corrosion
06	Dissolved oxygen	Presence due to dissolved oxygen.	D. O. corrode water lines, boilers and heat exchangers, at low level marine animals cannot survive.
07	Total Hardness	Presence of calcium (Ca^{2+}) and magnesium (Mg^{2+}) ions in a water supply**.** It is expressed. Hardness minerals exist to some degree in every water supply.	Poor lathering with soap; deterioration of the quality of clothes; scale forming
08	Total Alkalinity	Due to dissolved gases (CO_2)	Embrittlement of boiler steel. Boiled rice turns yellowish

09	TDS	Presence all dissolved salts	Undesirable taste; gastro-intestinal irritation; corrosion or incrustation
10	Calcium	Precipitate soaps, anionic	Interference in dyeing, textile,
11	Magnesium	surfactants, anionic emulsifiers,	paper industry etc.
12	Ammonia	Due to dissolved gases and degradation of organics	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
13	Barium	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	Increase in blood pressure
14	Biochemical Oxygen Demand (B.O.D.)	Organic material contamination in water	High BOD decreases level of dissolved oxygen.
15	Carbonate	Due to dissolution of CO_2	Product imbalance Unsatisfactory production Short product life
16	Chloride	Water additive used to control microbes, disinfect.	Eye/nose irritation; stomach discomfort. Increase corrosive character of water.
17	Nitrate	Runoff from fertilizer use; leaking from septic tanks, sewage; erosion of natural deposits	Effect on Infants below the age of six months Symptoms include shortness of breath and blue-baby syndrome.
18	Phosphate	-	stimulate microbial growth, Rancidity Mold growth
19	Sodium	Natural component of water	-
20	Sulphate	Due to dissolved Ca/Mg/Fe sulphates	Taste affected; gastro-intestinal irritation. Calcium sulphate scale.

Table 2: Different analytical water quality parameters with their analytical technique and guideline values as per who and Indian standard

Sr.No.	Parameter	Technique used	WHO standard	Indian Standard	EPA guidelines
1	Temperature	Thermometer	-	-	-
2	Color	Visual / color kit	-	5 Hazen units	-
3	Odour	Physiological sense	Acceptable	Acceptable	-
4	Electrical conductivity	Conductivity meter / Water analysis kit	-	-	2500 us/cm
5	pH	pH meter	6.5 – 9.5	6.5 – 9.5	6.5 – 9.5
6	Dissolved oxygen	Redox titration	-	-	-
7	Total Hardness	Complexometric titration	200 ppm	300 ppm	< 200 ppm

8	Alkalinity	Acid – Base titration	-	200 ppm	-
9	Acidity	Acid – Base	-	-	-
10	Ammonia	UV Visible Spectrophotometer	0.3 ppm	0.5 ppm	0.5 ppm
11	Bi carbonate	Titration	-	-	-
12	Biochemical Oxygen Demand (B.O.D.)	Incubation followed by titration	6	30	5
13	Carbonate	Titration	-	-	-
14	Chemical Oxygen Demand (C.O.D.)	C.O.D. digester	10	-	40
15	Chloride	Argentometric titration	250 ppm	250 ppm	250 ppm
16	Magnesium	Complexometric titration	150 ppm	30 ppm	-
17	Nitrate	UV Visible Spectrophotometer	45 ppm	45 ppm	50 mg/l
18	Nitrate	UV Visible Spectrophotometer	3 ppm	45 ppm	0.5 mg/l
19	Potassium	Flame Photometer	-	-	-
20	Sodium	Flame Photometer	200 ppm	180 ppm	200 ppm
21	Sulphate	Nephelometer / Turbidimeter	250 ppm	200 ppm	250 ppm

IV. CONCLUSION

Assessment of bore well water sample of devrukh city are varying outer or physic chemical parameter. The value of physicochemical parameter like total hardness, Na K , and Ca, Mg under the acceptable value of WHO and BIS. The total hardness having is low BW 6, 8 and 11. The devrukh region having low conc of the minerals like sodium potassium , calcium and magnesium[12-13].

The treatment having the Filtration and increasing the minral contains and RO , electro dialysis the remaining samplefor moderate the hardness which suitable for drinking and industrial purpose .The magnesium Calcium ,pH, hardness below the acceptable limit since its problematic[14].

REFERENCES

[1] Rabbi, M.A., Hasan, M.M. & Akhter, A.(2016) Heavy metals content in inlet water, treated and untreated waste water of garments industries at Gazipur, Bangladesh.*; Environmental Science: An Indian Journal,* 12(4), 133-136.

[2] Munnaf, A. Islam, M.S., & Tusher T.R.(2014) Investigation of Water Quality Parameters Discharged from Textile Dyeing Industries, *Journal of Environmental Science & Natural Resources,* 7(1), 257– 263.

[3] Manjare, S. A., S. A. Vhanalakar and D. V. Muley, (2010), Analysis of water Quality using Physico-Chemical parameters Tamdalge Tank in Kolhapur District, Maharashtra, International Journal of Advanced Biotechnology and Research, 1(2), pp 115-119.

[4] Navneet, Kumar, D. K. Sinha, (2010), Drinking water quality management through correlation studies among various physicochemical parameters: A case study, International Journal of Environmental Sciences, 1(2), pp 253-259.

[5] Pawar, Anusha, C., Nair, Jithender, Kumar, Jadhav, Naresh, Vasundhara, Devi, V., Pawar, Smita, C., (2006), Physico-chemical study of ground work sampl from Nacharam Industrial area, Hyderabad, Andhra Pradesh, Journal of Aquatic Biology, 21(1), pp 118-120.

[6] Yahaya, M.I., Mohammad, S. & Abdullahi, B.K. (2009) Seasonal variations of heavy Metals concentration in Abattoir dumping site soil in Nigeria. *Journal of Applied Sciences for Environmental Management*, 13(4): 9-13.

[7] Alom, M.M. (2016) Effects on Environment and Health by Garments Factory Waste in Narayanganj City, Dhaka, *American Journal of Civil Engineering*, 4(3): 64-67.

[8] Rai, B. (2013) Pollution and Conservation of Ganga River in Modern India. *International Journal of Scientific and Research Publications*, 3(4):1-4.

[9] Dixit, Savita & Tiwari, Suchi (2007) Effect of religious practices on water quality of Shahpura Lake, M.P, India, *Water International,* 32(1): 889-893.

[10] Sonel, .Manishal (2010) Physico-chemical and bacteriological studies of ground water layers in Bhanpur, Bhopal(M.P).,*Current World Environment,* 5(2): 379-382 .

[11] Renu, Nayar and Tiwari, Deepak (2008) Studies on the physico-chemical characteristics of ground water of korba. *Current world Environment.J.,* 3(1): 175-180.

[12] **Varale**, **A. S. &**Varale, Y.S.(2012) Study of phosphate present in the underground Water of nipani town, *ActaChim. Pharm. Indica.,* ISSN: 2277-288X2(4), 163-167. Peer Reviewed and Indexed..

[13] **Varale**, **A. S. &**Varale, Y.S. (2012) Determination of BOD in the underground water of Nipani Town,*Journal of Chemical and Pharmaceutical Research.,* ISSN : 0975-73844(10):4601-4603.Peer Reviewed and Indexed.

[14] **Varale**, **A. S. &**Varale, Y.S.(2012) Residual Chlorine Concentrations in Underground Water Samples Collected From Tube Wells of Nipani Town, *Universal Journal of Environmental Research and Technology.,*eISSN : 2249 0256 Volume 2, Issue 1: 105-107. Peer Reviewed and Indexed.