ASSESSMENT OF PHYSICAL STATUS OF GROUND WATER SAMPLES IN AKOLA, MAHARASHTRA, INDIA

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Abstract

The present work was undertaken to analyse the different water quality parameters, viz, pH, Electrical conductivity (EC), Total dissolved solids (TDS), Total alkalinity (T.alk) and Total hardness (TH). Ground water samples were collected from different residential areas of Akola city, M.S. (India). The result were compared with the values stipulated by world health organisation (WHO) for drinking water quality. It was found that the ground water was contaminated at few residential areas, while others shows physical parameters within the water quality standards and the quality of water was good and for it was fit drinking and irrigation purpose.

Keywords :Physical parameters of water, potable water, ground water

Introduction

Protection and management of ground water quality are emerging as great public concern in India. People are becoming more conscious about the nature of ground water and its usage : regarding its future utility which is not only affected by our human activities but also by its current uses extravagance and over expectation especially in urban areas . Recently there was great use and cry about presence of pesticide residues in bottled mineral water is obtained from ground water, then processed and packed.

A result of urbanization is the increased in demand and creation of potential with possibility of ground water pollution . A number of studies in the past have an impact on the quality of ground water . A similar situation is being encountered in most of the metropolitan cities with growing urban centres . Ground water contaminated from aforesaid sources is injurious to human being if it does not satisfy the prescribe drinking water standards. It is essential to demarcate the potable and non – potable ground water zones based on desirable and maximum permissible limits of various physico- chemical parameters implementing necessary remedial measures to prevent the occurrence of adverse condition.

Akola, the major town of Maharashtra is infested with foundries, chemicals, garbage, wastage of cow dung etc. untreated effluents from these source and domestic sources not only pollute surface water but also percolate down to ground water adversely affecting its physicochemical and biological characteristics. So, present research work has been undertaken in an attempt to study the extent of diffusion pollution that has threatened the existing ground water resources and to use the data so obtained in prediction and protection of this invaluable resources.

Studies regarding the ground water analysis have been made by many authors like Singh and Kapoor (1989), Ravichandran and pundharikanthan (1991) Latha *at al* (2002), Gupta and Saxena (1996), Gupta and Gupta (1999), Rajasekara Pandian *et al.* (2005), Yadav *et al* (2012). They concluded that is the high rate of exploration than its recharging, inappropriate dumping of solid as well as liquid wastes lack of strict enforcement of law and loose governance are the cause of deterioration of ground water quality.

Material and Methods

After a survey of some area of Akola city, four types of locations were closed for collecting ground water samples. Each type of locations has four sampling stations which included mostly the hand pumps and some dug wells. The sampling points were classified

occupation wise using stratified random sampling techniques as HIG (Big Umari area), MIG (Jatharpeth), LIG (Gorakshan area), IA (MIDC) area. Samples from various ground water sources were collected for the evaluation of physical parameters. The collected samples were analysed in the laboratory as per standards methods.

PH (Hydrogenation Concentration):

It was determined with the help of a pH meter using glass electrode and reference electrode. The pH meter was calibrated by buffer solution (Buffer table 9.2). After calibrating, the pH meter with buffer solutions, the electrode assembly was removed and washed with distilled water. Now, it was dipped into the water sample and the pH of the sample was read from the meter.

Electricalconductivity: -

It is the measure of the ability of an aqueous solution to carry the electric current. It was determined by conductivity measurement method:

$$K = \frac{1{,}000{,}000x}{Rm\{1+0.0191(t-25)\}}$$

Where K= Conductivity in u mhos/cm at 25^0C., x= Cell constant in cm, Rm= measured resistance of sample in ohm., t= temperature of measurement.

$$\text{Total Dissolved solids (mg/l)} = \frac{(B-A)x1000}{V}$$

Where ,A Initial mass of evaporating dish (g)., B = Final mass of evaporating dish (g).

Volume of water samples taken in mL.

Total alkalinity (T.alk.):-

It is the quantitative ability of water to react with a strong acid at a designated pH. It was determined by neutralization titration with strong acid H_2So_4 using methyl orange and phenolphthalein indicators.

Total alkanity (T.alk.) : =1/50X (A+B)/100X50X1000ppm

Where, A= Volume of N/50 H_2So_4 used to phenolphthalein end point (ml)

Total hardness (TH) :

The total hardness of water refers to the sum of concentrations of alkaline earth metal cations present in it. The TH was determined by complexometric using EDTA as titrant.

Results and Discussion:

pH range :-

The pH range in the four residential areas under investigations was between 7.53 and 8.9

Table 1 : The range of **pH values** of different four types of residential areas of Akola city

Sr. No.	Residential areas of Akola	Lowest	Highest	Mean
1	Higher income group (HIG)	6.78	7.98	7.38
2	Minimum income group (MIG)	7.23	8.43	7.83
3	Lowest income group (LIG)	6.89	8.17	7.53
4	Industrial area	7.38	8.74	8.06

It is safe from the point of potability and plant growth as well. Infact lightly alkaline water is better for plant growth compared to acidic water (pH < 7.0). It goes that the pH of ground water over the year in all the four residential areas is well within the desirable range.

Electrical Conductivity (EC):

High EC values make water unsuitable for irrigation, boilers etc. The mean EC values of ground water samples collected round the year are given table 2.

Table 2 : The **EC values** of different four types of residential areas of Akola city

Sr. No.	Residential areas of Akola	Lowest	Highest	Annual Mean
1	Higher income group (HIG)	1023	1759	1391
2	Minimum income group (MIG)	839	2286	1543.5
3	Lowest income group (LIG)	1208	2479	1843.5
4	Industrial area	1383	2778	2080.5

The maximum permissible limit of EC is 400 mhos/cm.

From table 2 it is clear that the mean value of industrial area was the highest . It may attributed to large amount of industrial waste seeping into ground to contaminate water with heavy metal ions and anions.

ISSN (PRINT): 2393-8374, (ONLINE): 2394-0697, VOLUME-11, ISSUE-9, 2024
DOI: 10.21276/ijcesr.2024.11.9.35

Total Dissolved Solids (TDS):

Table 3 : The mean **TDS values** of different four types of residential areas of Akola city

Sr. No.	Residential areas of Akola	Lowest	Highest	Annual Mean
1	Higher income group (HIG)	597	915	756
2	Minimum income group (MIG)	703	1072	887.5
3	Lowest income group (LIG)	712	1135	923.5
4	Industrial area	958	1399	1178.5

Maximum permissible limit = 500mg/l

TDS of more than 500mg/l make the water undesirable for drinking purposes, present investigations have revealed that maximum was from the sample collected from LIG and industrial area

Where TDS was as high as 923.5 and 1402 mg/l, respectively.

Total Alkalinity:

The result presented in table 4 revealed that the lowest mean values of Total alkalinity was found for the HIG areas and the highest of the LIG area. It was definitely on the higher side.

Table 4 : The **Alkalinity range** of different four types of residential areas of Akola city

Sr. No.	Residential areas of Akola	Lowest	Highest	Annual Mean
1	Higher income group (HIG)	122	179	150.5
2	Minimum income group (MIG)	351	776.12	563.56
3	Lowest income group (LIG)	387.73	698.34	543.035
4	Industrial area (IA)	448.8	789.6	619.2

Maximum permissible limit = 500mg/l

Total Hardness:

Present studies have revealed (Table 5) that TH of ground water in HIG and MIG areas were well within the prescribed limits.

Table 5 :The**Total hardness** of different four types of residential areas of Akola city

Sr. No.	Residential areas of Akola	Lowest	Highest	Annual Mean
1	Higher income group (HIG)	122	179	150.5
2	Minimum income group (MIG)	351	776.12	563.56
3	Lowest income group (LIG)	387.73	698.34	543.035
4	Industrial area (IA)	448.8	789.6	619.2

Maximum permissible Limit = 300mg/l

It was slightly greater in LIG but there was no cause for alarm. however, in the IA, areas it was alarmingly high. Water with excess hardness is known to cause heart disease and kidney problems.

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