



Research Article

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Physico- chemical analysis of ground water for drinking from selected sample points around the Banmeru Science College, Lonar Buldana district of Maharashtra

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ABSTRACT

Fresh water is essential for healthy environment to support the life systems on this planet. Hence a study of water in different aspects becomes imminent. The increasing population in the state of Maharashtra invites problem for the short supply of drinking water. In particular, Buldana district village people's daily using ground water as source of drinking water. In the present study, the ground water samples were collected from selected sampling stations around the Late Ku. Durga K. Banmeru Science College, Lonar dist Buldana and analyzed for its various analytical parameters related to quality of drinking water prescribed by WHO, ICMR, ISI etc. The results indicate the safe level of pollutant in water and can be consumed with little treatment.

Key Words: pH, Turbidity, Conductivity, Chloride, DO and hardness.

INTRODUCTION

Water is an essential constituent of all animals, plants and human beings. Different sources of water like rain water, river water, spring water, mineral water bore well water meet requirement of each living organisms. Water sources available for drinking and other domestic purpose must possess high degree of purity, free from chemical contamination and micro-organism. Forest holds rain water releases it slowly to ground water table. Inspire of abundant water resources, near about 1/3rd population has to depend on drinking water scarcity, is always a burning problem. Many catchments areas do not have sufficient water for drinking purpose is very much limited as compared to its consumption. Water can be distribution and water scarcity problem can be resolved to some extent. The people from interior of Buldana district and around the Late Ku. Durga K. Banmeru Science College, Lonar dist Buldana of Maharashtra state uses well, bore well water for their daily activities and also for drinking purpose. Water resources are poorly managed in the rural areas of Maharashtra. As policy matter, Government of the state has the work place and in poorly maintained housing schemes. The good quality water supply to such citizens is a need of this century. Due to uneven rainfall during the year, people have to use ground water from bore well. Industrial pollution has further affected the water quality.

We have identified ten such borewells in the region and people around around the Late Ku. Durga K. Banmeru Science College, Lonar dist Buldana, it use borewell water for drinking purpose. A detailed survey on the portability of different borewell water resources was conducted and suggestions have been made for their improvement.

EXPERIMENTAL SECTION

Samples were collected in the precleaned polythene bottles after rinsing in with the samples water. From each sample point, water was collected three times and analyzed for various water quality parameters. Water samples were collected using standard methods² (APHA 1989). The physico-chemical parameters are determined by the

method prescribed in the literature³. Five (05) different physical parameters and ten (10) chemical parameters were determined and the suitability for drinking is suggested by comparing the value reported by WHO & ISI. The results were also interpreted with respect to influence of industrial activities on its quality and possible treatment is proposed for hygienic potable water.

RESULTS AND DISCUSSION

The physico-chemical data of the bore wells water samples collected in summer-12. The results of the samples with different collecting places because of the different nature of soil contamination. In the present study temperature ranged from 18-36°C. The water samples were investigated from three samples for five major different physical parameters and their average values are listed in Table – 1. It was found that all the water samples were colourless, odourless and slight salty taste. The bore wells water has the alkaline pH range of 7.3 to 8.4 and the values are well within the safe limit for drinking. The pH value of drinking water is an important index of acidity, alkalinity and resulting value of the acidic-basic interaction of a number of its mineral and organic components. The concentrations of total solids are in the range between 680 to 992 mg/l. According to WHO and Indian standard, T.D.S. value should be less than 500 mg/L for drinking water but present study T.D.S. ranged from 520 to 975 mg/L, showing high values for the some sampling station bore. The higher value of total dissolved solids (TDS) can be related with the solids waste deposits near the bore well⁴. A slow leaching process also is held responsible for such higher value. The probable reason for objectionable values of TDS must be investigated with respect to chemical parameters. The difference between total solids and total dissolved solids is referred as suspended solids and ISI standard limit, this value is only 5 mg/g the filtering capacity of soil has negative effect on the suspended solids and will reduce its value in the ground water⁵. By using appropriate filtration technique, the values of TDS and TSS can be improved. Turbidity of ground water samples were obtained after analysis of water samples showing range from 0.5 to 6.5. Electrical conductivity (EC) is a measure of water capacity to convey electric current. It signifies the amount of total dissolved salts. EC values were in the range of 620 micromhos/cm to 1440 micromhos/cm.

The chloride content ranges from 25 to 590 mg/L natural water contains low chloride ions, i.e. finding indicates that most of samples are below the permissible limits of chloride in drinking water prescribed by Indian Standard Index. Alkalinity leads to corrosion and influences the chemical and biochemical reactions. Alkalinity was observed in the ranges 170 to 225 mg/L, within the permissible limit of 200 mg/L.

The chemical parameters are summarized in the Table -II. The pH of the water is related to the presence of dissolved CO₂ and/or organic acids formed by decay of organic matter. Acidity may also arise due to presence of mineral acids produced by hydrolysis of salts of certain heavy metals⁶. The pH of the water averages to about 6.25 which are well within acceptable limits. Similar values were also reported in the literature⁷. Alkalinity of water defined as the ionic concentration, which can neutralize the hydrogen ions. The phenolphthalein alkalinity is zero indicating absence of any hydroxide and carbonate ions. The ISI limit for total alkalinity is 50-200 mg/l. It means water sample from bore well have higher alkalinity which can be attributed to the concentration of calcium and magnesium salts. The presence of hydrated salts of sodium and potassium is responsible for the difference in the values of total alkalinity and total hardness⁷. The leaching process through surface water during rainy season can also add to higher value of alkalinity⁸. However little abnormal value of alkalinity is not harmful to human beings⁶. Total hardness of sample is in the range 160 to 485 mg/l. While ISI standard permits any values less than 500 mg/l. The hardness of water is due to dissolution of alkaline earth metal salts from geological matter. The dissolved oxygen in the water sample averages to 6 mg/l, which is lower than the permissible limits of 8 mg/l. For good quality of drinking water. The aquatic life is held responsible for lowering the value of dissolved oxygen. The ISI suggests that dissolved oxygen should be between 4-6 mg/l. The value of DO will show variation due to mixing of fresh water during rainy season. The rainy water is rich in O content⁹. The higher value of DO can impart good aesthetic taste to drinking water.

The anionic concentration in terms of chloride and sulphate are within the acceptable limit permitted by WHO. The little variation in the concentration of these ions is due to leaching of acidic salts from the nearby industrial effluent. The SIS standard for inorganic phosphorus is 0.1 mg/l. All the water samples have values higher than 0.1 mg/l. It indicates that the soil has higher amount of phosphate deposits and by chemical reaction it enters the water table. A higher degree of treatment is necessary for the removal of inorganic phosphorus. The nitrate content is very high, but little abnormal value will not have adverse effect on the water quality.

All the chemicals used for analysis were of AR grade. Double distilled water was used for the preparation of reagents and solutions. The major water quality parameters considered for the examination in this study are

Temperature, PH , dissolve oxygen (D.O.), total alkalinity, total dissolve solid (T.D.S.), calcium and magnesium, sulphate, nitrate, contants.¹¹

TABLE-I Physical parameters of water samples of selected of sites around the Late Ku. Durga K. Banmeru Science College, Lonar District Buldana.

Sample pointes Parameters	I	II	III	IV	V	VI	VII	VIII	IX	X
pH	7.3	7.8	7.4	7.5	7.5	7.3	7.4	8.4	7.4	7.6
TS	648	528	602	992	520	788	710	825	840	742
TDS	640	520	582	975	518	775	705	752	835	735
T(NTU)	2.0	0.5	1.2	6.5	0.8	5.2	2.1	1.5	2.5	2.0
EC	1054	964	742	1420	620	1100	1094	1300	1210	1156

EC=Electrical Conductivity; TS=Total Solids; TDS=Total Dissolved Solids; T=Turbidity

TABLE-II Chemical parameters of Water samples of selected sites around the Late Ku. Durga Banmeru Science college Lonar district Buldana.

Sample pointes Parameters	I	II	III	IV	V	VI	VII	VIII	IX	X
Total Alkalinity	190	220	220	215	205	210	225	175	200	212
Total Hardness	170	200	304	165	484	420	365	160	185	222
Calcium Hardness	110	125	234	130	342	390	280	102	125	172
Magnesium Hardness	60	75	70	35	142	30	85	58	60	50
Dissolved Oxygen	5.98	6.23	5.47	6.33	6.04	5.81	6.23	6.12	5.99	6.00
Chloride	97	91	84	86	88	79	92	91	87	90
Nitrate	12	14	16+	14	21	22	17	18	17	15
Phosphate	0.12	0.34	0.65	0.76	0.34	0.87	0.45	0.78	0.67	0.58
Copper	1.20	1.34	1.97	1.23	1.86	1.54	1.36	1.69	1.35	1.38
Iron	23	27	49	24	47	25	10	52	27	32

All results are in mg/lit

CONCLUSION

From above results and discussion, it is clear that, the water samples from selected points are of poor quality and they require higher degree of treatment before consumption.

Some following treatment methods are suggested.

- 1) An adequate filter system before the use, which will remove suspended solids & colloidal particles.
- 2) Proper aeration by keeping the water in atmosphere and addition of KMnO_4 , after pumping the water from borewell.
- 3) Addition of coagulant like alum to water.
- 4) Hot soda-lime solution should be used for the precipitation of metallic salts.

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