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Study of Physico-Chemical Parameters of Drinking Water in Pravara Areas around Pravara River

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ABSTRACT

Ground water samples were collected from different locations in the radius of 25 km of Pravara areas around Pravara River (India). These water samples from 10 sampling points of Kolhar were analyzed for their physicochemical characteristics. Laboratory tests such as pH, hardness, chloride, alkalinity and TDS etc. were performed for the analysis of the samples. On comparing the results against drinking water quality standards laid by World Health Organization (WHO), it is observed that some of the water samples were non-potable for human being due to high concentration of one or the other parameter. The usefulness of these parameters in predicting ground water quality characteristics were discussed.

Keywords: Water quality parameters, physiochemical study, pollution study, drinking water.

INTRODUCTION

Ground water is the principal source of drinking water in our country and indispensable source of our life. Water is most essential commodity for human consumption and is one of the most important renewable resources, which must be prevented from deterioration in quality. Various physico-chemical parameters like pH, alkalinity, total hardness, total dissolved solid, calcium, magnesium, nitrate, sulphate have a significant role in determining the potability of drinking water. The problem of ground water quality is acute. The resulting degradation of water quality in water body creates a condition so that water cannot be used for intended beneficial uses including bathing, recreation and as a source of raw water supply [1]. Relationships between dependent and independent variables have been used to relate pollution indicators and estimate the quantity and quality of pollutants or indicators in water bodies [2,3]. Pollution increases day by day due to industrialization, population explosion, deforestation, and vehicular exhaust and by the burning of fossils fuels. Unfortunately, the quality of water has deteriorated immensely because of various types of pollution [4-6].

Fertilizers and pesticides are major contributors to water pollution, nitrates from fertilizers are a common chemical pollutant of water. Heavy metals, sulphates, nitrates, chlorides, phosphates, carbonates, ammonia, pesticides, phenols, soaps, detergents are the common chemical pollutants. There are a number of pathogenic micro-organisms which cause water borne disease in man. Water served to consumer must be free from disease carrying bacteria, toxic substances, excessive amount of mineral and organic matter [7]. 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 [8]. The water used for

drinking purpose should be free from toxic elements, living and non-living organisms and excessive amount of minerals that may be harmful to health. Keeping this in focus, the quality aspects of ground water around Kolhar were analyzed for general water quality. Hence, it is highly essential to examine the presence of toxic substances in distribution water for potable purpose before it is used for drinking.

MATERIALS AND METHODS

Sample collection: Water samples from the selected sites were collected during Sept 2012-Jan 2013 and taken in pre-cleaned polyethylene bottles. The samples after collection were immediately placed in dark boxes and processed within 6 h of collection.

Physico-chemical analysis

The collected samples were analyzed for major physical and chemical water quality parameters like pH**,** total dissolved solids (TDS), total hardness, DO, nitrate, chloride, alkalinity, phosphate and turbidity as per the methods described in "Standard methods for the examination of water and wastewater ",American Public Health Association (APHA) [9, 10]. The parameters present in the water sample can be calculated by using various methods [11]. The pH of all the water samples was determined using a pH meter (Model no 101 E, Systonic). The chloride, total hardness and total alkalinity were estimated by the standard methods of water and waste water [12, 13]. Total alkalinity was determined by visual titration method using methyl orange and phenolphthalein as indicator. Total hardness and calcium were measured by EDTA titrimetric method using EBT indicator respectively. Chloride was determined by Argentometric method using potassium chromate indicator. The chemical data were complied further to know location wise distribution.

RESULTS AND DISCUSSION

pH -The pH was alkaline values ranges from 7.24 to 8.36. The factors like air temperature bring about changes the pH of water. Most of biochemical and chemical reactions are influenced by the pH.

Nitrates -The values of nitrate ranges from 4.31-5.33 mg L^{-1}.

Hardness -The value of hardness fluctuates from 301-465 mg L^{-1}. High value of hardness during summer can be attributed to decrease in water volume and increase of rate of evaporation of water. In the present study, most of samples were having high amount of calcium and magnesium hardness above the highest desirable limits. Some samples were exceeding even the maximum permissible limits. High concentration of calcium is not desirable in washing, laundering and bathing.

Phosphate -The value of phosphate fluctuates from 4.35-5.34 mg L^{-1}.

Alkalinity-Total alkalinity ranges from 167-216 mg L^{-1} . The alkalinity was maximum value due to increase in bicarbonates in the water and due to high photosynthetic rate.

Chlorides-The values of chlorides range from 145mg L^{-1} to 224 mg L^{-1} .The contribution of chloride is due to minerals and chlorination. Human excreta particularly the urine contains chloride in amount equal to the chloride consumed with food and water.

Dissolved Oxygen-The values of DO fluctuates from 6.98 mg L^{-1} to 8.24 mg L^{-1}. The high DO in summer is due to increase in temperature and duration of bright sunlight has influence on the percentage of soluble gases oxygen and carbon dioxide.

Total Dissolved Solid- In the present study, the total dissolved solid (TDS) is varied between 481 to 655 mg L^{-1}. In the present study, samples from tube well have significantly higher amount of chloride and

TDS. They suggest possibilities of ground water pollution. It might be due to sewage or industrial sources. They might contribute to ground water pollution. Therefore proper disposal of industrial waste with periodical monitoring of ground water is recommended.

Turbidity- The turbidity of water fluctuates from 3.42 NTU to 4.33 NTU. The maximum values might be due to human activities, decrease in the water level and presence of suspended particulate matter.

Table: Sample Analysis

Sample/Parameter	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
pH	8.21	7.47	8.11	8.36	8.45	7.24	8.37	8.29	7.25	8.32
Nitrate (ppm)	4.86	4.31	5.14	4.68	4.72	5.33	4.87	5.06	5.23	4.96
Hardness (ppm)	354	301	311	315	421	323	314	416	465	306
Phosphate (ppm)	4.35	4.68	4.78	5.11	4.68	5.02	4.74	4.65	4.77	5.34
Alkalinity (ppm)	178	167	201	188	175	184	216	185	187	211
Chloride (ppm)	145	176	168	135	197	204	183	224	189	206
DO (ppm)	6.98	7.56	7.67	7.85	7.45	8.11	8.23	7.58	8.24	7.35
TDS (gm/lit)	655	568	687	523	511	491	522	481	633	622
Turbidity (NTU)	3.70	3.42	4.33	4.15	4.16	3.65	4.32	4.21	4.21	3.65

APPLICATIONS

The data is useful for knowing the quality of water which we are drinking

CONCLUSIONS

The ground water which was taken from the various places around Kolhar was analyzed and the analysis reports that the water quality parameters like pH, nitrate, hardness, phosphate, alkalinity, chloride, DO and turbidity lies within the maximum permissible limit prescribed by WHO. Except few parameters like DO, TDS and hardness of few samples were reported higher than the permissible level. It is found that some of the water samples are non-potable for human being due to high concentration of DO, TDS and hardness parameter.

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