Physicochemical Parameters for Assessing the Water Quality in the Present

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Abstract- The human population contracts a variety of water-borne diseases as a result of using contaminated drinking water, it is imperative that the quality of the water be examined on a regular basis. In order to avoid infections and enhance quality of life, it is essential to have access to clean water. It is important to be knowledgeable about the various physico-chemical criteria used to test the quality of water, including colour, temperature, acidity, hardness, pH, chloride, DO, BOD, COD, and alkalinity. For the exploring parameter study, several water analysis reports with physic-chemical parameters have been provided. The value of a genuine water sample can also be compared using guidelines for several physicochemical properties.

Keyword: Water, Physico - chemical, Parameters, Hardness, BOD.

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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 [1].

Over the years the demand for water has increased and this has led to water scarcity in many parts of the world. The situation is aggravated further due to water contamination. India is heading towards a freshwater crisis mainly due to improper management of water resources and environmental degradation, which has lead to a lack of access to safe water supply to millions of people. This freshwater crisis is already evident in many parts of India, varying in scale and intensity depending mainly on the time of the year. During the past two decades, the water level

in several parts of the country has been falling rapidly due to an increase in the number of bore wells drilled for irrigation of agricultural fields. India's rapidly increasing population and changing lifestyles have also increased the domestic need for water. The water requirement for the industry also shows an overall increase. Intense competition among users such as agriculture, industry, and domestic sectors is bringing the groundwater table further down. The quality of groundwater is getting severely affected because of the widespread pollution of surface water. Contamination is mainly by discharge of untreated wastewater through bores and leach ate from unscientific disposal of solid wastes.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[2,3,4]. 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. [5]. 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 [6.Industrial development (Either new or existing industry expansion) results in the generation of industrial effluents, and if untreated results in water, sediment and soil pollution [7, 8].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. 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 [9].Geochemical studies of groundwater [10]. Heavy

exploitation of groundwater was found to be reason for the quality deterioration in this district [11].In the most recent studies, researchers found that rock–water interaction and evaporation are the main reasons for the water quality deterioration in this region [12].The concentrations of these ions are more than the permissible limit for drinking purposes [13].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 are making environmental conservation a difficult task [14].

Materials and Methods

The sampling bottles soaked in 1:1 HCL for 24 h were rinsed with distilled water followed by deionized water. At the time of sampling, the bottles were thoroughly rinsed two or three times, using the groundwater to be sampled. The collected samples were analyzed for pH, electrical conductivity and other chemical parameters. The pH of the samples was investigated using digital pH meter (Systronics, 802) and electrical conductivity was determined using conductivity meter (Systronics, 304). Chemical analysis of the samples was done using titration (Mohr's method) and other methods as per standard protocol [15]. The samples were maintained at 4˚C after sampling and analyzed within a few hours (< 3 h) of collection. The BOD was measured respirometrically using the oxitop method with means of replicates used for statistical analysis. Nitrification was suppressed by the addition of 0.5mg L-1 allythiourea. This is essential for retarding biological action, hydrolysis of chemical compounds and complexes and reduction of volatility of constituents. For COD, Sulphuric acid was added to bring pH to 2 and refrigerated. The mixed, homogeneous effluents were taken out from the refrigerator only at the time of analysis. These samples were used for analysis of BOD and COD using the methods [16].

Results and Discussion

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 and total alkalinity [9].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 [17]. The pH in the groundwater is varied from 7.2 to 8.4 in all the samples of the study area and is within safe limit.

EC (Electrical Conductivity)

Conductivity shows significant correlation with ten parameters such as temperature, pH value, alkalinity, total hardness, calcium, total solids, total dissolved solids, chemical oxygen demand, and chloride and iron concentration of water. [18]. 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. The value of EC is between 0.89 and 2.8μS/cm.

Total dissolved solids

The range of total dissolved solids from 411 to799 mg/l. This shows that most of the stations fall above standard level this shows that anthropogenic impact which can be due to agricultural activity leading to local spatial and temporal variability of runoff. The classification of water quality parameter TDS is alienated into three categories. These are most suitable for less than desirable value for drinking (<500 mg/l) and permissible for drinking (in between 500-1500 mg/l).

Total hardness: The determined total hardness in all stations is from 372 to 915 mg/l .The hardness of the many stations in pre and post-monsoon seasons are well above the standard level set by BIS as 300 mg/l.

Calcium: Calcium in the sampling stations range from 80 to 195 mg/l. In some of the stations, it falls above the standards of 75 mg/l.

Magnesium: Magnesium in the sampling stations ranges from 36 to108 mg/l. In some of the sampling stations, magnesium falls above the standard desirable limit in both the seasons.

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. Sodium concentration in sampling sites ranging from 52 to 226 mg/l

Potassium: Potassium concentration in sampling sites ranging from 2 to 26mg/l respectively. The classification of water quality parameter potassium is alienated into three categories. These are suitable for drinking (<100 mg/l) and not suitable for drinking (>200 mg/l)

Bicarbonates: Bicarbonate concentration at sampling sites ranging from 87 to 292 mg/l respectively.

Sulphates: Sulphate concentration in the sampling sites ranging from 45 to 167 mg/l respectively. The classification of water quality parameter sulfates is alienated into two categories. These are suitable for drinking (<250 mg/l)

Chlorides: The chloride value ranges from 52 to 316 mg/l .Chloride concentration in most of the sample was found higher than the highest desirable level (250 mg/l).

Dissolved Oxygen (DO)

Dissolved oxygen the presence of dissolved oxygen is essential to maintain the higher forms of biological life and to keep proper balance of various pollutions thus making the water bodies healthy. The chemical and biochemical process undergoing in water body are largely dependent upon the presence of oxygen. Estimation of dissolved oxygen is a key test in water pollution and waste treatment process control. The permissible value recommended for DO is 5mg/L as per Indian standard. In the present investigation dissolved oxygen ranged from 1.76 – 8.4 mg/l.

Biochemical Oxygen Demand (BOD)

The amount of oxygen required oxidizing substances to carbon dioxide and water may be calculated by stoichiometry if the chemical composition of the substance is known. The most widely used parameter of organic pollution applied to both wastewater and surface water is the – day BOD. This determination involves the measurement of the dissolved oxygen used by microorganisms in the biochemical oxidation of organic matter.BOD values for water samples were found 18.0- 19.0mg/L. The permissible limit for drinking water is 30mg/L. BOD values were observed within the limit for all the samples. All the values are determined using standard laboratory techniques; at a temperature of 20oC.The standard test condition lets in incubating the sample in an air tight bottle, in dark at a required temperature for specific.

Chemical Oxygen Demand (COD)

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Table 1. Showing Result of the chemical analysis of ground water samples

Sl. No.	Water Quality Parameter	W.H.O. standards in ppm		I.S.I. standards in ppm		Analysis of the area investigated	
		Min.	Max.	Min.	Max.	Min.	Max.
1	pH	6.5	8.5	6.5-8.5	6.5-9.2	7.2	8.4
2	EC	500	2000	500	1500	890	1800
3	Ca	75	200	75	200	80	195
4	Mg	50	150	30	100	36	108
5	Na	-	200	-	200	52	226
6	K	-	12	-	12	2	26
7	HCO_3	500	1000	-	-	87	292
8	Cl	200	600	250	1000	52	316
9	SO_4	200	400	150	-	45	167
10	TDS	-	500			411	779
11	TH	-	200		300	372	915
12	Alkalinity					20	128
13	BOD	30				8	19
14	COD	250				50	260
15	Turbidity		5		5	2	8

Conclusion

The chemical make-up and compatibility of the groundwater sources for irrigation and drinking have been assessed. The groundwater sample malignancy in the study region is within allowable drinking water quality standards. According to the observed COD and BOD values, COD declines as OD increases. Which show the waste's low biodegradability; demand additional care during the treatment operations; and must be handled before being disposed of. This study revealed that urban water in Hyderabad's Medchal district is less hard and contains more dissolved ions.

Acknowledgments

We express our thanks to Ch. Gopal Reddy, Secretary, CMRGI, Principal and HOD, CMR College of Engineering & Technology Hyderabad, for help and encouragement to publish this paper.

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