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## Assessment of Physico-Chemical and Bacteriological Status of Ground Water Resources in Aurangabad, M.S. India

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### **Abstract:**

*The physico-chemical and bacteriological status of water samples from nine major part of the locality in Aurangabad City was assessed. Selection of sampling points done on the basis of their importance with respect to population around. The physico-chemical parameters like Temperature, pH, Electrical conductivity (EC), Total Hardness (TH), Total dissolved solids (TDS), Total solids (TD), Dissolved Oxygen (DO), Turbidity, Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Magnesium ( $Mg^{++}$ ), Sodium ( $Na^+$ ), Calcium ( $Ca^{++}$ ), potassium ( $K^+$ ), Chloride ( $Cl^-$ ), Fluoride ( $F^-$ ), Sulfate ( $SO_4^{2-}$ ), Phosphate ( $PO_4^{3-}$ ) and bacteriological analysis done by MPN method. The physico-chemical parameters for six samples found within permissible limit of WHO; whereas, Total Hardness (TH), Calcium, and Magnesium in three samples found above permissible limit. Bacteriological studies shows contamination in two water samples*

**Keywords:** Physico-chemical, bacteriological, contamination, MPN, water pollution

### **1. Introduction**

Ground Water is the major source of drinking water in both urban and rural areas. The importance of ground water for the existence of human society cannot be overemphasized. Groundwater crisis is not the result of natural factors. It has been caused by human action much of ill health which effects humanity, especially in the developing countries can be traced to lack of safe and wholesome water supply (Parihar S.S., Kumar Ajit, Kumar Ajay, Gupta R.N., Pathak Manoj, Shrivastav Archana and Pandey A.C, June 2012).

Groundwater is the chief source of drinking water in India and this is only 0.61% of the total available water on Earth. It is reported that only 4% of world's freshwater resources are available in India, while India inhabitants 14% of the world population. This shows scarcity of water in India. Article 47 of Indian Constitution rests the responsibility of providing safe drinking water to the public with the State Governments. According to one estimate, 64% of the rural population and 91% of the urban people have access to safe drinking water. The availability of water in India is almost fixed due to limited resources. But, with growing Indian population the per capita availability of water is steadily reducing; and when this drops below 1700m<sup>3</sup>/ person/ year, India will be water stressed (Prof. S K Singh, Lokesh Kumar, Dec 2014). Ground water contains high amount of various ions, salts etc. so if we were using such type of water as potable water then it leads to various water-borne diseases. Unsafe drinking water contributed to numerous health problems in developing countries such as the one billion or more incidents of diarrhea that occur annually (Parihar S.S., Kumar Ajit, Kumar Ajay, Gupta R.N., Pathak Manoj, Shrivastav Archana and Pandey A.C, June 2012). For centuries, human have been disposing off wasteproducts by burning, placing them in streams, storing them on ground or putting them in the ground. Humaninduced influences on surface water quality reflect not only waste discharge directly into a stream, but also include contaminated surface runoff. The quality of ground water is most commonly affected by waste disposal and land use (Anwar Khalid, Amir Haider Malik, Amir Waseem, Shazmeen Zahra and Ghulam Murtaza (Dec 2011)

### **2. Material and Method**

#### *2.1. Physico-Chemical Analysis*

The chemicals used were of A. R. grade and was used without further purification. The solutions were prepared in distilled water. The pH of water sample was measured with the help of pH meter Elico made (LI-120) with a glass electrode. The pH meter was calibrated using buffer of pH 4.0 and 7.0. The conductance of water sample was measured using conductometer COD determination aliquot of

sample water was taken in a round bottom flask which was acidified by concentration  $H_2SO_4$  and solid  $HgSO_4$  (0.4 gm) was added. A Standard  $K_2Cr_2O_7$  solution was added to the resultant mixture and refluxed for two hours and unreacted  $K_2Cr_2O_7$  was determined by titrating against known concentration of FAS. The amount of phosphate was determined by using colorimetric method. The chloride ions present in the sample was determined by Mohr's method.

For determination of hardness, EDTA solution of its disodium salt was prepared in distilled water, it was standardize by using Zinc ion solution at pH 10 and using solochrome black T indicator. Total nitrogen is determined by using Kjeldhal method Potassium was determined by using flame photometer

## 2.2. Microbial Analysis

### 2.2.1. Quantitative (MPN)

For Quantitative MPN test, graduated amounts of water are transferred to a series of fermentation tubes containing lactose bile broth of single and double strength. As per usual practice to inoculate five fermentation tubes each with 10ml water, one tube with 1ml water, and another with 0.1ml water.

The tubes are incubated at 35C and examined at the end of 24hrs; the tubes showing negative result were reincubated and examined at the end of 48hrs.

With reference to MacCraday's table, no of bacteria/100ml of the sample is determined.

## 2.3. Qualitative

### 2.3.1. Presumptive Test

To carry out this test sterile Lactose bile broth with Durhams tube is inoculated with water sample, followed by incubation of 24hrs at 37C temp and examined for production of acid and gas.

## 2.4. Confirmed Test

All fermentation tubes showing gas within 48hrs at 37C shall be utilized in the confirmed test. On sterile Eosin Methylene Blue Agar a loopful of culture from each positive fermentation tube. The plates are inverted and incubated at 37C for 24hrs. After incubation observe plate for presence of 3 different types of colonies.

1. Typical-nucleated, with or without metallic sheen.
2. Atypical-opaque, nonnucleated, mucoid after 24hrs incubation, pink.
3. Negative-all others.

## 3. Result and Discussion

The water samples were collected from different localities. The results are shown in table 1

Parameters	Minimum	Maximum	Average
Temp $^{\circ}C$	20	34	28
pH	4.5	8.2	7.00
Conductivity mS	0.257	18.97	2.262
Total Solids ppm	345	1200	1265
TDS ppm	270	1234	1450
COD ppm	25	524	220
Total Phosphate ppm	3.57	12.94	5.254
Chloride ppm	60	2510	211.50
Sulphate ppm	30.8	95.65	60.92
Total Hardness ppm	180	7520	946.2
Calcium Hardness ppm	45	8475	658.8
Mg Hardness ppm	55	1578	425.63
Total Nitrogen ppm	1.2	35.8	4.640
Potassium ppm	52	18.7	25.85
Sodium ppm	65	185	44.62

Table 1: The average, minimum & maximum values of physico-chemical parameters

- pH: In the present investigation the pH of groundwater varies from 5.5 to 8.2
- Electrical conductivity: In the present investigation electrical conductivity varies from 0.257 to 16.97 mS
- Total Solids: There are different materials which are found to be dissolved in water. In this study the TS varies from 345 to 1000 ppm.
- TDS: Total dissolved solids is the presence of salt, minerals due to eroded soils. In this study the TDS varies from 270 to 1144 ppm

- Total Phosphate: The main source of total phosphate is detergents, fertilizers and inorganic chemicals. In the present investigation the total phosphate is found to be
- COD ppm : In the present investigation the COD is found to be 220 to 524 ppm
- Chloride: It was expected that the groundwater may contain very less amount of chloride. It was true for most of the station, but at some sites it was very high 2510 ppm. The average value is very less
- Sulphate: The anions like sulphate are part of strong acids. we observed more concentrations of sulphate 30.8 to 95.65 ppm
- Total Hardness: The capacity of the water to form foam with soap is called hardness. It is of two type calcium hardness and magnesium hardness.
- Sodium & Potassium: The sodium content of water under investigation was found to be less compared to the potassium.65 to 185ppm
- MPN Test: With reference to MacCraday's table, in 07 samples number of bacteria per 100ml was found to be within permissible limit, where as in 02 sample number of bacteria per 100ml was found to be 38 and 16.
- Qualitative analysis:
  - Presumptive Test-After incubation lactose bile broth tubes shows production of acid and gas, which is considered as positive presumptive test.
  - Confirmed Test-Typical colonies with metallic sheen was observed. This indicates faecal contamination in the water sample.

#### 4. References

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