ASSESSMENT OF GROUND WATER QUALITY USING PHYSICO-CHEMICAL PARAMETERS OF AMRAVATI, MAHARASHTRA, INDIA.

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Abstract
The study was carried out to determine Physico-chemical parameters in the Groundwater samples from Amravati, Maharashtra during the period (Nov-2016 to March-2017). The suitability of water for drinking was studied by collecting 15 samples from Tube wells located in Amravati. Water samples were analyzed for Physico-chemical parameters including temperature, pH, color, turbidity, conductivity, and salinity. By using Water Analyser Kit at the sample's station the parameters determined are as follows: Temperature [26.6-31.4]ͦC, pH [7.36-8.24], Turbidity [0.1-1.89] NTU, conductivity [3.76-14.6] ms, and Salinity [3.84-77.2] ppm. From the result it is found that most of the parameters in Amravati are within the desirable limit recommended by IS10500:2012 and WHO standards. From the study it is clear that the water of Chanduri 1, Chanduri 2, Badnera, and Anjangaonbari 2 is saline, so it is not suitable for drinking purposes. The conductivity of water in Rathi Nagar appeared to be less. All parameters except salinity were found in permissible limits.

Key Words – Physico-chemical parameters, Water Quality, Tube Well, Ground water, Amravati.

1. Introduction
Water is an important resource for mankind’s livelihood and economic development. It is a greater resource of humanity. About 30% of the world’s freshwater resources exist in the form of groundwater. Water has no alternative in the facts the essence and sustenance of life are based on the water. It is also the universal solvent with the unique property of dissolving substances and for the same reason it is susceptible to contamination. Water is a resource for agriculture, manufacturing, and other human activities [1], [2]. Water for the consumption of human beings is available in different forms from different sources. Drinking water should be free from color, Salinity, Turbidity, and conductivity [2], [3]. The study revealed the various Physico-chemical parameters viz, Temperature, pH, color, turbidity, conductivity, and salinity which is recommended by IS 10500:2012 and WHO. The assessment was based on samples obtained from the tube well and on-site testing using water Analyser kit.

2. Need of Study
For drinking purposes, both urban and rural areas depend on Groundwater sources. The domestic sewage, industrial waste, land-use practices, including fertilizer application, dairy operations, and ranching, and septic-system use are the leading causes of groundwater pollution. To protect public health from waterborne diseases Assessment of groundwater in rural and urban areas of Amravati is necessary.

3. Study Area
Amravati is one of the eleven districts of Vidarbha regions of Maharashtra state. It is the second-largest and populous city of Vidarbha region of Maharashtra. It is located at Latitude N 20°32’ and 21°46’ and Longitude E 76°37’ and 78°27’. The total area of the district is 12210 sq.km. The average elevation of Amravati is about 343 m. The sampling sites in Amravati was selected based on the basic information, availability of groundwater sources, and the characteristics of topography, size, shape, depth, etc. The study was carried out to determine Physico-chemical parameters in the Groundwater samples from Amravati [4]. Maharashtra during the period (Nov-2016 to March-2017).

3.1 Objective of study
1. To study the Physico-chemical properties of Groundwater to fulfill the need for safe drinking water where tap water is not available.
2. To study the temp, pH, color, turbidity, conductivity, and salinity of Groundwater samples.
3. To study various causes of contamination of groundwater.

4. Materials and Methods
4.1 Collection of water samples
Total 15 numbers of water samples were collected from the
tube well located at different locations [5]. The locations
are shown in Fig. 1. The semi-transparent PVC bottles
were used to collect the water samples [5]. The level of
water in the tube well in these areas is about 70 to 180 ft in
depth.

4.2 Analysis of water samples

All the 15 samples collected were analyzed for Physico-
chemical parameters, determined by the Water Analyser kit
[6]. It is a microcontroller-based instrument for measuring
Physico-chemical parameters in water samples one at a
time. The water analyzer kit consists of a combined
electrode, conductivity cell, and temperature probe. pH and
salinity were measured using a combined electrode and
conductivity cell [7]. Temperature was measured using a
temperature probe. The reading obtained from these is
summarized in Table 1.

5. Location map and physio-chemical parameters

![Location map](image)

Fig. 1 location map of the study areas.
Location map is shown in Fig. 1.

6 Result and Discussion

The result obtained from the testing of water samples
collected are summarized in Table 1. This analytical data
is compared with IS10500:2012 and WHO standard [8].
From this we came to know that the temperature of water
samples found in between 28.2°C-31.4 °C is a normal
condition.

The taste of water samples in the case of all the sources was
as usual. The variation in temperature is shown in Fig 2.

![Temperature Variation](image)

Fig. 2 showing variation in temperature.

Naturally water is having a property of colour less. In both
the Guruchaya colony and Yashoda Nagar's water samples,
the color of water found to be brownish color. This
brownish color to water is by the presence of ion and due
to corrosion of water pipe. This water is unsuitable for
drinking. One can use this water for drinking by filtering it.
According to the IS10500:2012 recommendation, the pH
for drinking water is in between 6.5-8.5 pH. The average
pH value in different samples found to be in range 7.36-
8.24 within permissible limit [8]. The pH shows the
concentration of hydrogen ion in water. The variations in
results of pH are shown in Fig 3.

| Sampling Station No. | Samples Location | Temp | pH  | Colour       | Turbidity (NTU) | Conductivity (ms) | Salinity (ppm) |
|----------------------|------------------|------|-----|--------------|-----------------|------------------|---------------|
| 1                    | Sainagar         | 30.4 | 7.89| Transparent  | 1.50            | 12.8             | 430           |
| 2                    | Chanduri 1       | 28.8 | 7.87| Transparent  | 1.34            | 13.1             | 750           |
| 3                    | Chanduri 2       | 28.9 | 7.98| Transparent  | 0.65            | 12.8             | 800           |
| 4                    | Mhada            | 29.8 | 7.73| Transparent  | 0.56            | 8.84             | 500           |
| 5                    | Akoli            | 28.4 | 7.69| Transparent  | 0.45            | 9.53             | 550           |
| 6                    | Guru Chaya Colony| 27.8 | 7.68| Brownish     | 0.52            | 10.6             | 450           |
| 7                    | Badnera          | 28.9 | 7.79| Transparent  | 0.23            | 14.6             | 750           |
| 8                    | Anjangaon bari1  | 28.6 | 7.36| Transparent  | 0.46            | 8.83             | 500           |
| 9                    | Anjangaon bari 2 | 30.9 | 7.44| Transparent  | 0.89            | 14.0             | 800           |
| 10                   | Old bypass       | 29.3 | 7.64| Transparent  | 0.32            | 10.1             | 587           |
| 11                   | Dastur nagar     | 29.8 | 7.92| Transparent  | 1.20            | 10.2             | 502           |
| 12                   | Yashoda nagar    | 29.5 | 7.75| Brownish     | 1.89            | 8.33             | 480           |
| 13                   | Uttam nagar      | 31.4 | 8.24| Transparent  | 0.78            | 6.75             | 384           |
| 14                   | PRMCEAM, college | 28.5 | 7.89| Transparent  | 0.10            | 12.8             | 384           |
| 15                   | Rathi nagar      | 28.2 | 7.70| Transparent  | 0.98            | 3.92             | 567           |
The turbidity found in all samples is between 0.10-1.89 NTU. The desirable limit for turbidity according to IS10500:2012 and WHO [8], [9] is 5 NTU. The maximum turbidity of 1.89 NTU was found in Yashoda Nagar whereas the minimum turbidity was found in Badnera at PRMCEAM College which is 0.1 NTU. In Amravati, the turbidity found to be less than the desirable limit. The variations in results of turbidity are shown in Fig 4.

In Amravati the maximum conductivity found to be 14.6 ms in Badnera and the minimum conductivity found is 3.92 ms in Rathi Nagar. Electrical conductivity indicates the amount of ion, mineral etc. dissolved in water. Temperature also affects the conductivity of the water, as the temperature of water increases, the conductivity also increases. The variations in results of Conductivity are shown in Fig 5.

In Amravati maximum salinity is 800 ppm found in Chanduri, Anjangaon Bari 2, and the minimum salinity found is 384 ppm in Uttam Nagar and PRMCEAM College. High salinity water intake is responsible for high blood pressure and hypertension. Maximum salinity causing yield decline or even death of the plant. Usually salinity is high in the summer season and low in winter season due to the water percolation in the ground during the rainy season. The variations in results of Salinity are shown in Fig 6.

6. Conclusion

The assessment of various Physico-chemical parameters such as Temp, pH, color, turbidity, Total Dissolved Solid, conductivity, salinity was carried out by using Water Analyser Kit. From the study it is clear that the water of Chanduri 1, Chanduri 2, Badnera, and Anjangaonbari 2 is saline, so it is not suitable for drinking purposes. The conductivity of water in Rathi Nagar appeared to be less. All parameters except salinity were found in permissible limits. pH, turbidity, were found within the desirable limit. The purpose of the study is to check the suitability of water for drinking purposes. This will create awareness among people regarding the ground water.

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