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Physicochemical Investigations of Water from Diverse Sources and Their Comparisons

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Abstract- Water is a critical natural resource, essential for sustaining life, maintaining ecological balance, and supporting economic development. The safety and quality of drinking water are vital for human health, yet they are often compromised by chemical and microbiological contaminants. This study investigates the physicochemical and biochemical characteristics of Groundwater water in the Talni region to evaluate their suitability for human consumption. Results showed that most physical and chemical parameters of the water samples were within the permissible limits as prescribed by WHO (1971) and BIS (1991). The study further highlights the influence of these water quality parameters on aquatic biotic communities and primary productivity. Regular monitoring of water quality is emphasized to ensure public health and ecological stability.

Keywords- Groundwater water and Lake water, Ahmedabad, Physico-chemical andInvestigation, ecological studies, Comparative studies.

I. INTRODUCTION

1.1 Importance of Water

Water is one of Earth's most vital natural resources, covering nearly 75% of the planet's surface. It is crucial for sustaining all living organisms. The World Health Organization (WHO) recognizes access to clean and safe drinking water as a fundamental human right. However, rapid industrial development, widespread use of chemical fertilizers and pesticides, and environmental pollution have led to a significant decline in drinking water quality.

1.2 Understanding Groundwater

Groundwater resides beneath the Earth's surface in spaces within soil, sand, and rock layers called aquifers. These underground water reserves are replenished by precipitation, including rain and melted snow. Unfortunately, in many regions, excessive extraction and contamination from various human activities such as agriculture, industry, and domestic waste are posing serious threats to groundwater quality.

1.3 Factors Affecting Groundwater Quality

The quality of groundwater is influenced by both natural geological factors and human-induced sources. Naturally occurring minerals like calcium, magnesium, sodium, potassium, chlorides, and bicarbonates contribute to its chemical makeup. Meanwhile, pollutants from factories, farms, and urban areas can severely degrade water quality and make it unsafe for use.

1.4 Purpose of the Study

The key objectives of this study are:

- To assess the hydrochemical characteristics of groundwater in the Talni region.
- To examine important parameters such as TDS, hardness, pH, turbidity, chloride, and alkalinity.
- To promote awareness about groundwater conservation at the Gram Panchayat level.
- To inform the local population about the health risks associated with elevated levels of certain water quality indicators.

1.5 Description of the Study Area

Talni is a village located in Hadgaon Taluka of Nanded District in Maharashtra. The community primarily depends on groundwater sources such as bore wells, open wells, and hand pumps for drinking and agricultural purposes. This study emphasizes groundwater pollution in the area, particularly from agricultural runoff and domestic waste, and aims to highlight the need for sustainable water resource management.

II. WATER QUALITY PARAMETERS

1. **Temperature:** Temperature is a key water quality parameter. It affects biological activity, chemical reactions, and overall water quality. High or low temperatures can impact aquatic life and water usability. A thermometer is used to accurately measure water temperature.

2. **Colour:** Colour is an important indicator of water quality, referring to the true colour after turbidity has been removed. It helps in assessing the presence of dissolved organic matter or industrial pollutants. The Platinum-Cobalt visual comparison method is commonly used to evaluate water colour.

3. **Odour:** Odour significantly influences the acceptability of drinking water. It may indicate the presence of organic substances or contamination. Odour is assessed using a wide-mouth, glass-stoppered bottle.

4. **Taste:** Taste determines the palatability of water, ranging from agreeable to disagreeable. It may be affected by the presence of dissolved minerals, chemicals, or contaminants. Taste is evaluated directly by tasting the water under controlled conditions.

5. **pH:** pH is a vital parameter that measures the acidity or alkalinity of water. It influences chemical reactions and the solubility of substances in water. A pH meter is used to determine the pH value accurately.

6. **Turbidity (NTU):** Turbidity refers to the cloudiness or haziness in water due to suspended particles, affecting light penetration and aquatic life. A turbidity meter is used to measure turbidity in Nephelometric Turbidity Units (NTU).

7. **TDS (Total Dissolved Solids):** TDS represents the total concentration of dissolved substances in water, including minerals, salts, and organic matter. High TDS may affect taste and water usability. A TDS meter is used for measurement.

8. **8 Alkalinity:** Alkalinity indicates water's capacity to neutralize acids and maintain stable pH levels. It is essential for buffering capacity in aquatic systems. It is measured using the titrimetric method.

9. **9 Chloride:** Chloride concentration in water helps identify pollution sources and affects corrosion potential. It is measured by the titrimetric method.

10. **10 Total Hardness:** Total hardness is the sum of calcium and magnesium content in water. It affects water usage in households and industries. A complexometric titrimetric method is used for measurement.

11.

Sr. No.	Test	Processed Sample	Sample 1	Sample 2	Sample 3	Sample 4
1	Temperature	30	29	29	28	29
2	Color	<1	<1	<1	<1	<1
3	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5	pH	6.9	7.0	7.2	7.2	7.1
6	Turbidity (NTU)	0.2	0.3	0.5	0.3	0.4
7	TDS (ppm)	152	153	155	154	155
8	Electrical Conductivity (EC), (µmhos/cm)	3206	3200	2806	3112	3100
9	Total Alkalinity (TA)	150	158	164	158	178
10	Total Hardness (TH) mg/L	236	250	272	265	280
11	chloride (Cl^-) mg/L	60	54	49	58	67

III. COMPARISON AND ANALYSIS OF WATER QUALITY PARAMETERS

- **Physical Parameters:**All samples meet the standards for temperature, color, odour, and taste. No indicators of contamination.
- **pH:**Ranges from 6.9 to 7.2 — all within neutral to slightly alkaline range, ideal for drinking.
- **Turbidity:**Ranges from 0.2–0.5 NTU. Far below the 1 NTU standard. Indicates high water clarity.

- TDS & EC:All TDS values (152–155 ppm) indicate soft, low-mineral content water.EC values reflect mineral presence and are within the expected range for safe consumption.
- Total Alkalinity:Ranges from 150–178 mg/L. All well under 200 mg/L desirable limit, showing moderate buffering capacity.
- Total Hardness:All samples exceed the desirable limit of 200 mg/L slightly but are well below the permissible limit (600 mg/L).Indicates moderately hard water, which is safe but may lead to minor scaling in pipes or appliances.
- Chloride:Ranges from 49–67 mg/L. All values far below the limit of 250 mg/L, indicating no saltwater intrusion or industrial discharge.

IV. CONCLUSION

All water samples meet the ISI 10500 standards for Groundwater water.

- No physical, chemical, or biological parameters suggest contamination.
- Variations in hardness and alkalinity are minor and pose no health risks.
- The water is safe for drinking and domestic use across all tested areas

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