



Seasonal Assessment Of Physico-Chemical Parameters Of Water In Selected Areas

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Abstract

Water quality plays a crucial role in determining its suitability for drinking, domestic, agricultural, and ecological purposes. The present study evaluates the seasonal variation in physico-chemical characteristics of water samples collected from three locations — Panem, Udbani, and Dumkadanga — during Pre-monsoon, Monsoon, and Post-monsoon seasons. Parameters analyzed include pH, Dissolved Oxygen (DO), Total Dissolved Solids (TDS), Total Hardness (TH), Chloride (Cl^-), Fluoride (F^-), and Sulphate (SO_4^{2-}), along with their quality rating index (qi). The results indicate that most parameters fall within permissible drinking water standards, though noticeable seasonal fluctuations were observed. Panem exhibited relatively higher TDS and hardness values, while Udbani showed better dissolved oxygen levels. The study highlights the importance of continuous monitoring to ensure sustainable water quality management.

Keywords: Water Quality, Seasonal Variation, Physico-Chemical Parameters, TDS, Hardness, Dissolved Oxygen, Water Quality Index.

Introduction:

Water is an indispensable natural resource that sustains life and supports socio-economic development. The quality of water is influenced by geological formations, climatic conditions, anthropogenic activities, and seasonal variations. Surface and groundwater systems undergo significant changes during different seasons, particularly in monsoon-dominated regions.

Assessment of physico-chemical parameters provides insight into the suitability of water for drinking and other uses. Parameters such as pH, dissolved oxygen, total dissolved solids, hardness, chloride, fluoride, and sulphate are commonly used indicators of water quality. Seasonal monitoring helps identify dilution effects during monsoon and concentration effects during pre-monsoon periods.

The present study aims to evaluate seasonal variations in water quality across Panem, Udbani, and Dumkadanga and to determine their compliance with standard drinking water guidelines.

2. Materials and Methods

2.1 Study Area

Water samples were collected from three locations:

Panem

Udbani

Dumkadanga

These areas experience distinct seasonal changes categorized into Pre-monsoon, Monsoon, and Post-monsoon periods.

2.2 Sample Collection

Water samples were collected during three seasons:

Pre-monsoon

Monsoon

Post-monsoon

Standard sampling procedures were followed to avoid contamination. Samples were stored in clean polyethylene bottles and analyzed in the laboratory.

2.3 Parameters Analyzed

The following physico-chemical parameters were determined:

pH

Dissolved Oxygen (DO)

Total Dissolved Solids (TDS)

Total Hardness (TH)

Chloride (Cl⁻)

Fluoride (F⁻)

Sulphate (SO₄²⁻)

Quality rating scale (qi) values were also calculated to assess overall water quality.

3. Results

3.1 pH

The pH values ranged as follows:

Panem: 7.72 – 8.35

Udbani: 7.28 – 8.04

Dumkadanga: 7.37 – 8.27

All samples were slightly alkaline and within permissible limits (6.5–8.5). Higher values were generally observed during pre-monsoon due to evaporation and concentration of dissolved minerals.

3.2 Dissolved Oxygen (DO)

Panem: 5.40 – 6.81 mg/L

Udbani: 7.46 – 7.78 mg/L

Dumkadanga: 5.71 – 7.16 mg/L

Udbani exhibited comparatively higher DO values, indicating better water aeration and lower organic pollution load.

3.3 Total Dissolved Solids (TDS)

Panem: 279.7 – 334 mg/L

Udbani: 127.9 – 150.7 mg/L

Dumkadanga: 158.8 – 224.6 mg/L

All values were within permissible drinking limits (500 mg/L). Panem showed relatively higher TDS during pre-monsoon season.

3.4 Total Hardness (TH)

Panem: 316.7 – 350.1 mg/L

Udbani: 81.15 – 150.1 mg/L

Dumkadanga: 114.2 – 139.5 mg/L

Panem water was moderately hard to hard, whereas Udbani and Dumkadanga fell under moderately hard category.

3.5 Chloride (Cl⁻)

Panem: 18.95 – 22.36 mg/L

Udbani: 16.78 – 22.94 mg/L

Dumkadanga: 24.21 – 35.82 mg/L

All values were well below the permissible limit of 250 mg/L.

3.6 Fluoride (F⁻)

Panem: 0.11 – 0.21 mg/L

Udbani: ~0.10 mg/L

Dumkadanga: 0.09 – 0.15 mg/L

Fluoride concentration was within safe limits (1.0–1.5 mg/L).

3.7 Sulphate (SO₄²⁻)

Panem: 28.39 – 35.11 mg/L

Udbani: 4.81 – 5.32 mg/L

Dumkadanga: 8.22 – 11.76 mg/L

All samples were within permissible limits (200 mg/L).

4. Discussion

Seasonal variation significantly influenced water quality parameters. Pre-monsoon samples generally exhibited higher TDS and hardness due to evaporation and concentration of dissolved salts. Monsoon season showed dilution effects, reducing ionic concentration but sometimes affecting dissolved oxygen levels due to surface runoff.

Panem recorded comparatively higher hardness and TDS values, possibly due to geological formations or mineral dissolution. Udbani demonstrated better dissolved oxygen levels, indicating lower organic pollution and better ecological conditions. Dumkadanga showed moderate values without significant contamination. The calculated quality index (qi) values suggest that overall water quality in the studied areas remains within acceptable limits for domestic use.

5. Conclusion

The seasonal analysis of water samples from Panem, Udbani, and Dumkadanga reveals:

All measured parameters fall within permissible drinking water standards.

Noticeable seasonal fluctuations occur, particularly in TDS and hardness.

Panem exhibits relatively higher mineral concentration. Udbani maintains better dissolved oxygen levels. Continuous monitoring is essential to ensure sustainable water quality management. The study confirms that the water sources are generally suitable for domestic purposes with minimal treatment.

6. Recommendations

Regular seasonal monitoring should be conducted. Awareness programs should be initiated to prevent contamination. Appropriate water treatment measures should be applied where hardness is high.

7.References

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