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PHYSICO-CHEMICAL CHARACTERIZATION OF WATER QUALITY IN THE CHELIFF RIVER

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Abstract

This study assesses the water quality of the Cheliff River through an in-depth physico-chemical monitoring programme conducted between 2021 and 2023. The main objective was to evaluate the extent of river pollution and its effects on the health of the aquatic ecosystem. A set of physicochemical parameters was measured, including pH, electrical conductivity, turbidity, biochemical oxygen demand (BODs), chemical oxygen demand (COD), suspended solids, water temperature and salinity. Sampling was carried out at seven strategically located stations, during the wet season (January–March) and the dry season (April–June), representative of the hydrological conditions of the Cheliff plain.

The results indicate a marked deterioration in water quality, characterised by high nutrient concentrations (NH_4^+ , PO_4^{3-} and NO_2^-), which significantly increase the risk of eutrophication. Concomitant decreases in electrical conductivity and pH were also observed at several stations. Stations S1, S2 and S6 showed particularly high levels of organic and chemical pollution, with BODs values ranging from 38.22 to 42.10 $\text{mg}\cdot\text{L}^{-1}$ and COD values reaching 358.83 $\text{mg}\cdot\text{L}^{-1}$. The mean Water Quality Index (WQI) was 50.7, indicating average quality, with several stations classified as poor ($\text{WQI} < 50$). Principal component analysis (PCA) revealed that parameters related to mineralisation and salinity (F1: 40.20% of variance) and oxygenation status (F2: 19.76% of variance) are the main drivers of water quality variability. Axis F3 (16.83%) contrasts organic pollution measured by COD with that measured by BODs/mineral salts, a distinction invisible on the F1–F2 plane; the three axes F1+F2+F3 together explain 76.79% of the variance. These results highlight the urgency of strengthening monitoring and implementing effective pollution control measures targeting industrial, agricultural and domestic sources.

Key words: Cheliff River, water quality index, eutrophication, pollution, physico-chemical parameters

Received: March, 2026; Revised final: July, 2026; Accepted: September, 2026

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