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Comparative wastewater quality indicators and multivariate analysis of Riyadh sewage treatment plants and its impact on irrigation of Riyadh district

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ABSTRACT

The ability of the communities to continue to live normally is doubtful if sufficient water is not allocated to agricultural irrigation. As a result, we try to analyze a non-conventional source of non-potable water for irrigation. The investigation assessed wastewater treatment plants in Riyadh, Saudi Arabia, particularly emphasizing tertiary-treated wastewater used for irrigation and groundwater replenishment. The present investigation aimed to evaluate the physicochemical parameters of Riyadh wastewater treatment plants (WWTPs) for being used in irrigation. In this study, 12 physicochemical and 1 microbial parameter were collected during 2013–2016. The treated wastewater (TWW) quality parameters were: chemical oxygen demand (COD), dissolved oxygen (DO), Cl^-, Na^+, Ca^{++} Mg^{++}, ammonia (NH_4), nitrate (NO_3), total dissolved solids (TDS), EC, pH, and *Escherichia coli* (*E. coli*). The Canadian Wastewater Quality Index (CWQI), and Comprehensive Water Pollution (CPI) were utilized for the assessment of wastewater quality for irrigation purposes. Additionally, principal component analysis (PCA) was used to determine the dependable parameters. The CWQI outcomes ranged from 73.75% to 95.26%. The variations during four years were acceptable and of sufficient quality for irrigation. The CPI results ranged from 0.16 to 1.61. However, it was found that the average CPI was 0.6, showing that there had been some light pollution throughout the entire time interval. The principle component analysis revealed that the first main component, representing 19% of the dataset, is crucial for understanding effluent characteristics. Other components include COD, NH_4, *E. coli*, NO_3, and Na, providing a dominant pattern. These factors provide a dominant pattern for understanding wastewater characteristics. The effluent from the Riyadh wastewater treatment plant is suitable for irrigation over the year. A substantial correlation between nitrite, turbidity, and CWQI was found using a stepwise regression model.

Keywords: Principle component analysis; Canadian wastewater quality index; Comprehensive water pollution; Treated wastewater reuse

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