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## **SEASONAL INFLUENCE AND RISK ASSESSMENT OF HEAVY METALS CONTAMINATION IN GROUNDWATER, ARJAAT VILLAGE, MOROCCO**

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### **Abstract**

The application of chemical fertilizers and fungicides is an important source of heavy metals into the agricultural soil. Leaching and weathering can facilitate the transport of the contaminants through soil to the groundwater. In most rural areas, groundwater is used for drinking and irrigation purposes, without any treatment, population being exposed to direct contamination. The study area in this paper, Arjaat Village from Rabat Salé Zemour Zaer Region of Morocco, matches into this category. No previous assessment of the environmental quality was performed in this area. To accomplish the goal of our study, water samples were taken from 25 farm wells during two seasons: summer (dry season) and winter (wet season). Measurements of physico-chemical parameters, as well as Fe and heavy metal (Cd, Pb, Zn, Cu, Mn, Cr, Ni) concentrations were performed, the data being compared with World Health Organization thresholds and analyzed using Hierarchical Cluster Analysis and spatial distribution analysis. The research, as a preliminary assessment of the Aarjat Village area confirmed a low degree of contamination of the groundwater, but also highlighted areas where accumulation of heavy metals manifests in correlation with seasonal variation and agricultural activities. Health risk assessment of the population was performed using Target Hazard Quotients, and the results proved to be below the limit for all heavy metals, except Zn during winter.

*Key words:* hazard index, hierarchical cluster analysis, spatial distribution, target hazard quotient

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