

Full Length Research Paper

Groundwater quality and its suitability for drinking and agricultural use in Ain Azel plain, Algeria

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Hydrochemistry of groundwater in Ain Azel plain, Algeria was used to assess the quality of groundwater for determining its suitability for drinking and agricultural purposes. Interpretation of analytical data shows that Ca-Mg-HCO₃ and Ca-Mg-Cl-SO₄ are the dominant hydrochemical facies in the study area. Factor analysis generated three significant factors. Factor 1 includes EC, Ca⁺⁺, Mg⁺⁺, Na⁺ and Cl⁻, factor 2 has high loading values of K⁺ and HCO₃⁻ and the factor 3 includes SO₄⁻ and NO₃⁻. The US salinity diagram illustrates that most of the samples fall in C3S1 quality with high salinity hazard and low sodium hazard. The groundwater of Ain Azel plain is low concentration of nitrogenous elements (NO₃⁻ and NO₂⁻) and the higher concentration of trace elements (Pb⁺⁺ and Fe⁺⁺) may entail various health hazards.

Key words: Groundwater, drinking and irrigation water quality, factor analysis, US salinity laboratory diagram, Ain Azel, Algeria.

INTRODUCTION

The Ain Azel alluvial plain of northern Algeria is a region of intensive agriculture. Over the few decades, competition for economic development, associated with rapid growth in population and urbanization, has brought in significant changes in land use, resulting in more demand of water for agriculture and domestic activities. Due to inadequate availability of surface water, to meet the requirement of human activities, groundwater remains the only option to supplement the ever-increasing demand of water. Groundwater is the primary source of water for domestic, agricultural and industrial uses in many countries, and its contamination has been recognized as one of the most serious problems in Algeria. Each groundwater system in an area is known to have a unique chemistry, which is acquired as a result of chemical alteration of the meteoric water recharging the system (Back, 1966; Drever, 1982). The chemical alteration of meteoric water depends on several factors such as soil-water interaction, dissolution of mineral species, duration of solid-water interaction and anthropogenic sources (Stallard and Edmond, 1983; Faure, 1988; Subba Rao, 2002). Importance of hydrochemistry of groundwater has led to a number of detailed studies

on geochemical evolution of groundwaters (Garrels, 1967; Paces, 1973; Sarin et al., 1989). Presentation of geochemical data in the form of graphical charts as the US Salinity diagram and Wilcox salinity diagram help to recognize the various hydrochemical types in a groundwater system. It further helps in evaluation of the suitability of groundwater for irrigation purposes. Hence, the present work had the objective of understanding the spatial and temporal distribution of hydrochemical constituents of groundwater related to its suitability for agriculture and domestic use. The trace elements and nitrogenous ions elements in this water are determined to check the quality of the water.

DESCRIPTION OF THE STUDIED AREA

The area of study is located in the East of Algeria characterized by a semi-arid climate and an average precipitation and temperature of about 296 mm/year and 15.2°C respectively (Belkhiri, 2005). Most of its inhabitants are concentrated in the town of Ain Azel with more than 30000 inhabitants working mainly in the production of cereals (barley, corn etc.). According to many authors (Savornin, 1920; Galcon, 1967; Guiraud, 1973; Vila, 1980) the area of concern is distinguished by two sets.

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