



REVIEW ARTICLE

Impact of iron concentration as a result of groundwater exploitation on the Nubian sandstone aquifer in El Kharga Oasis, western desert, Egypt



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Abstract The over exploitation represents the main problem of sustainable development of the groundwater aquifer in the study area, large drop in groundwater heads was recorded, it reached from 70 to 80 m, the main trend of water flow was also disturbed and many depleted closed areas were appeared. Groundwater quality shows relatively high salinity contents of some groundwater samples and abnormal concentration of iron element which was ranging from 2 to 10 mg/l produces rust-colored deposits and a brown slime that builds up on well screens, pipes, and plumbing fixtures. The dominant water type is sodium bicarbonate followed by sodium sulfate and sodium chloride. For proper development and optimal utilization of such non-renewable resources, daily groundwater exploitation should be decreased; the minimum spacing between wells should not be less than 2 km and total depth of wells should be between 600 and 700 m. Moreover, the present flood irrigation system should be replaced by more developed drip, sprinkle irrigation methods and less water consume crops should be recommended.

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1. Introduction

The area under investigation represents the northern part of El-Kharga Oasis. It lies between the latitudes $25^{\circ} 00'$ and $26^{\circ} 00'$ north and longitudes $30^{\circ} 00'$ and $31^{\circ} 00'$ east (Fig. 1). The area under investigation covers about 33,000 km². The study area is a part of Dakhla depression which is oriented north–south and extends southward from the escarpment of Abu Tartur Plateau to the granite hills of Abu Bayan. The north end of El Kharga Oasis is confined by Abu Tartur Plateau and Gebel Abu Tartur. To the southwest El Kharga is bounded by the west Kharga plain and to the east the Tebes Plateau. Elevations on the floor of the depression range from near 0 mean sea level (msl) to 120 m above msl. To the west,

surface elevations rise gently from the depression to over 400 m above msl in the Kharga plain. Sixty five groundwater samples representing shallow and deep productive water wells were collected and analyzed (Fig. 2).

Over-exploitation concept describes the situation where the rate of groundwater extraction exceeds the average rate of aquifer recharge (Foster and Loucks, 2006). Over-exploitation of groundwater can cause a series of irreversible environmental–hydrological problems such as lowering of groundwater heads, change of recharge/discharge condition, shortage of water resources, deterioration of groundwater quality, and reduction of single well yield, which seriously affect the implementation of sustainable development strategy of regional economy. Furthermore, the over-pumping may



Figure 1 Key map of the study area.

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