

THE QUALITY OF THE TABLECLOTH IN THE REGION OF RABAT SALE KENITRA

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Abstract

Environmental concerns presuppose a certain fundamental dynamism aimed at protecting ecosystems from all types of pollution and at improving environmental management. The objective of our work is to determine the degree of pollution of groundwater in the region of Rabat-Salé -Kénitra (Morocco). During the period 2020-2021, two groundwater sampling campaigns were carried out at wells located in rural and urban areas in the Tanoubart, Gharb, Shoul, Maamoura and Témara water tables. These samples were analyzed using the water quality assessment techniques described by Rodier (1978, 2009) and the recommendations made by the World Health Organization (WHO). The physicochemical analysis (Temperature, Hydrogen potential, Oxidability, Conductivity, Bicarbonate ion, Nitrites, Ammonium, Nitrates, Alkalinity) showed that the groundwater of the region of Rabat-Salé-Kénitra characterized by :

- Excellent qualities for the Gharb water table and the Temara water table ;
- Good quality for the Shoul tablecloth and the Maamouratablecloth ;
- Admissible to mediocre of the Tanoubart water table.

Introduction

In Morocco, groundwater constitutes a very important part of the hydraulic heritage. They have certain advantages over surface water in terms of covering needs and uses. There are 32 deep water tables and more than 46 surface water tables and the mobilizable groundwater resources are estimated at 4 billion m³, unevenly distributed in the different regions of the kingdom (Margat and Zebidi, 1991).

The underground water resources of the Rabat-Sale-Kénitra region constitute an important part of the heritage. Groundwater from the Rabat-Sale-Kénitra region plays a determining role in the socio-economic development of the region (ABHS, 2006).

In European countries, the study of continental groundwater has attracted the attention of many researchers in France for a long time (Dalmazet, 1960; Ginet and Decou, 1977; Gibert, 1986; Danielopol and Rouch, 1991; Marmonier, 1986, 1988; Gibert et al., 2004), than in Belgium (Martin et al., 2003 and 2009, in the Netherlands (Stock, 1961 and 1996) than in Spain (Camacho, 1992a, 1992b and 2008), in Romania (Botosaneanu, 1986, 1991), in Italy (Ruffo, 1961; Messina, 2003). Recently a synthesis study was made by Deharveng et al. (2009) in

the form of maps showing for example the degree of pollution in each region. Outside of Europe, the characterization of groundwater has also grown considerably in America (Holsinger 1972, 1986, 1994 and 2000), in Asia (Strouhal, 1961; POR, 1962; Deharveng and Leclerc, 1989), India (Tiway et al., 2009), Australia (Humphreys, 2008 and 2009) and Africa. Concerning the latter continent, only a few works have been published on the underground quality of the South of the Sahara by Magniez (1978), Messana (1982) and Ruffo (1985) and of the Maghreb by Ruffo (1953), Champpuis (1953), Nourisson (1956), recently by Merzoug et al (2010) and Khaldoun et al (2013) and in sub-Saharan Africa by Magniez (1979) and more recently by Zebaze-Togouet et al. (2009 and 2011).

In certain regions of Morocco, this groundwater, which constitutes the only drinking water resource for human populations, is dependent on a set of natural and anthropogenic factors. They are threatened by the aridity of the climate and by intense human activity. These resources undergo disturbances, which lead to a deterioration of their physico-chemical and metallic quality. All of the work done so far in the Gharb will be limited to the characterization physico-chemical and metal groundwater of maamurslick.

These studies have shown that the factors responsible for the degradation of water quality are most often related to location throughout the region. These wells are generally located in the areas characterized by the abundance of septic tanks and by the lack of hygiene.

In order to fill this void, we had to carry out this work which aims to study the physico-chemical quality in the region of Rabat-Salé-Kénitra.

Study environment

According to the last population census of 2014, the region of Rabat-Salé-Kénitra is ranked in 2nd place after the region of Casablanca-Settat, with a population of 4,580,866, i.e. a share of 13.53% of the total population of the country.

The average annual growth rate of the region over the period 2004-2014, 1.31% is equivalent to the national average (1.25%). However, this regional average hides quite significant disparities between the provinces and the prefectures of the region.

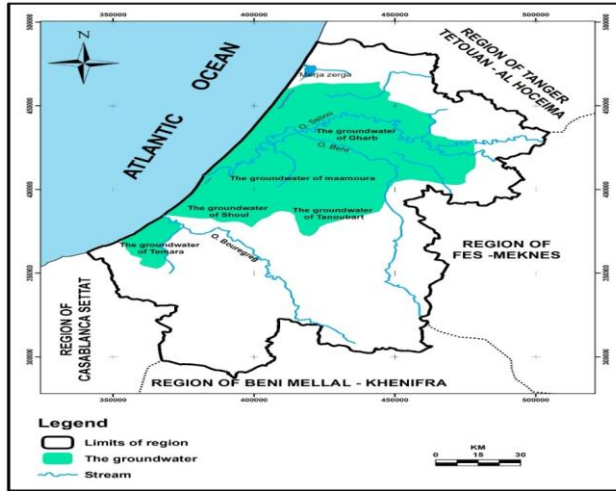


Figure 1 : The water table of the Rabat SaléKenitra region

Results and discussion

Tableau 1: Ground water results

	Shoul	Maamoura	Temara	Tanoubart	Gharb
T ° C	20.45	20.42	20.35	20.61	20.76
pH	7.21	7.178	7.83	7.55	7.99
conductivity	766.88	780.2	3,879	1495.4	2.129
O₂	0.44	5.366	1,933	0.734	0.449
Ca²⁺	112.33	93.9	11.352	114.54	20,648
Mg²⁺	28.5	3.18	5.834	55,686	8.996
Na⁺	120.27	103.44	27.95	276.7	57.1
K⁺	12.51	11.69	0.46	13.6544	0.893
HCO₃⁻	310.66	292.6	6.482	11.671	11.642
Cl⁻	152.67	132.52	28.326	396.52	59,898
SO₄²⁻	17.65	17.38	9.88	104.58	14.226
NO₂⁻	0.012	0.01	0.003	0	0
NO₃⁻	65.71	21,201	39.395	21.618	12,796
SiO₂	2.65	4,599	21,641	5.0923	22.306
NH₄⁺	0.096	0.095	1.812	0.062	1,595
TAC	5.2	4.92	6.442	6.345	6.417

-The Shoulsheet : an average temperature of 20.45 °C, and the hydrogen potential is an average value of 7.21, the electrical conductivity is 766.88 $\mu\text{S} / \text{cm}$, the oxygen below is 0, 44 mg / l, calcium is varies between 112.27, manganese is on average 28.5 mg /l, hardness is on average 158.17 mg / l, sodium is 120.27 mg /l, Ammonium is 0.096 mg / L, Chloride is 152.67 mg /l, Sulfate is 17.67 mg/L.

-The Maamoura slick is characterized by an average temperature of 20.42 C, and the hydrogen potential is of average value 7.178, the electrical conductivity is 780.2 $\mu\text{g} / \text{l}$, the oxygen below is 5.366 mg / l, calcium is 93.9 mg / l, manganese is on average 3.18 mg / l, sodium is 103.44 mg / l, Ammonium is 0.095 mg / l, chloride is 132.52 mg / l, the sulfate is 17.38 mg / l.

- The Temara aquifer has a temperature of 20.35°C, pH values evolve from the Temara aquifer with an average of 7.83, the electrical conductivity is 387.9 $\mu\text{S}/\text{cm}$, the HCO_3^- content is of 6.482 mg / l.

-The Tanoubart water table : The temperature is 20.61 ° C, hydrogen potential is 7.55. Total hardness is 6.8. The nitrate content is 276.7 mg / L. Manganese is 55.68 mg / l, chlorides is 396.52 mg / l.

- The Gharb slick has a temperature of 20.76 ° C, the hydrogen potential with an average of 7.99, the hardness is 2.43 mg / l, nitrate and nitrite is varies between 0 and 5, 7 mg / l, chloride is 59.898 mg / l.

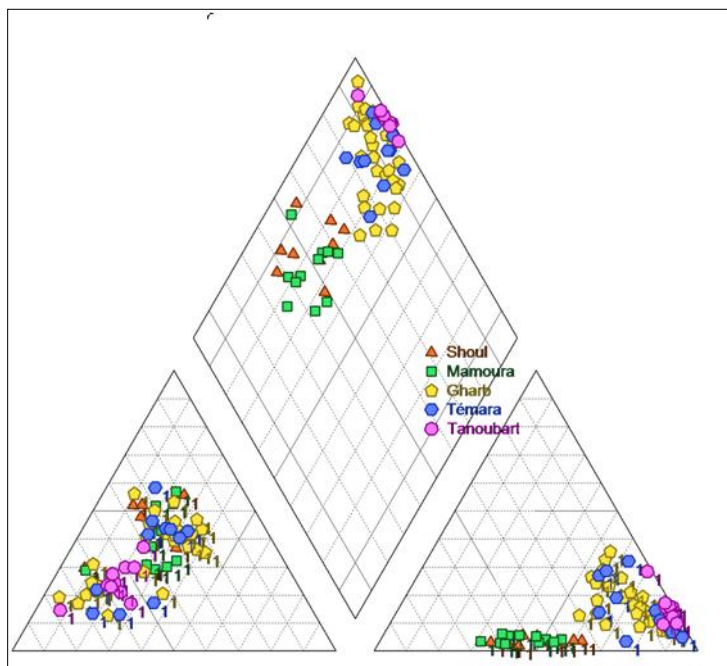


Figure 2: piper diagram

The representation of groundwater analysis data from the Rabat salty region of Kénitra on the Piper diagram indicates that there is little diversity. The vast majority of waters are of the magnesium-calcic type, more or less bicarbonated.

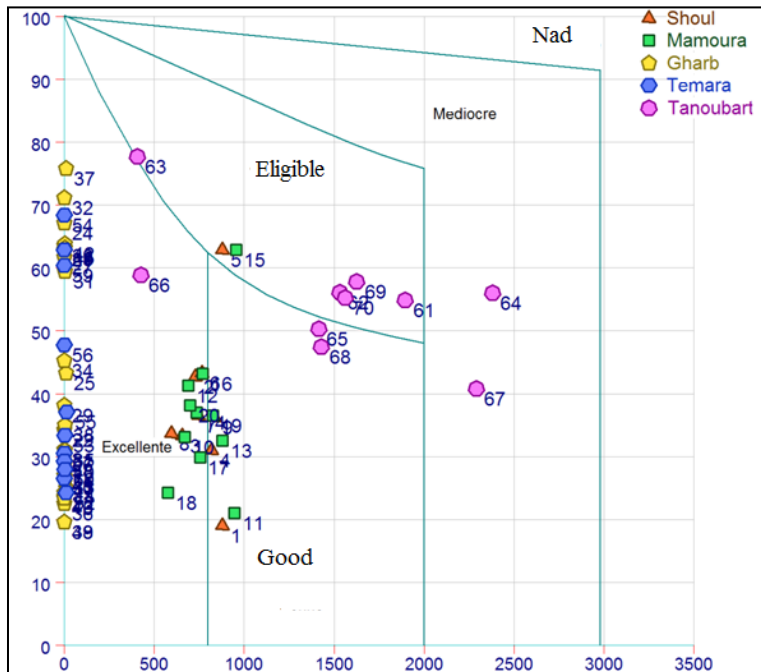


Figure 3:Classification of groundwater wells according to their quality

Thus the results obtained show that the tanoubart wells are loaded compared to the other wells of the Shoul, Gharb and Témara aquifers. So we can conclude that the tablecloth of Gharb and Témara are of excellent quality and Shoul and Mmamoura are of good quality, on the other hand the tablecloth of Tanoubart is of acceptable quality to mediocre.

Conclusion

The objective of this research work was to study the characterization of well water in the region of Rabat-Salé-Kenitra during the period extending from 2021. The specific objectives of this study were to understand, on the one hand, the physico-chemical quality of groundwater in the region of Rabat-Salé-Kenitra, and on the other hand the quantity of metallic element in the water from the various wells in the region.

From all of these results, it emerges that from a physicochemical point of view, the groundwater in the region of Rabat-Salé-Kenitra reflects water that is fairly oxygenated, neutral, and at a relatively stable temperature. The electrical conductivity and salinity reflect a high rate of mineralization, in relation to the carbonate nature of part of the substratum. Rather high levels of nutrient salts characterize above all the wells located in the area close to the wadi, which receive organic matter from wastewater discharges.

The representation of groundwater analysis data from the Gharb region on the Piper diagram indicates that there is little diversity. The vast majority of waters are of the magnesium-calcic type, more or less bicarbonated.

For this study, the classification protocol applied refers to European standards. This protocol is systematically applied to the classification of mineral waters (Belitz et al., 2009; Hubert et al., 2002; Lourenc, 2010) and seems to be more consensual.

The tanoubart wells are loaded with respect to the other aquifers, they are classified in the bad class.

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