Study of the Physicochemical and Bacteriological Quality of the Boukhalef - Tangier Water Table (Morocco)

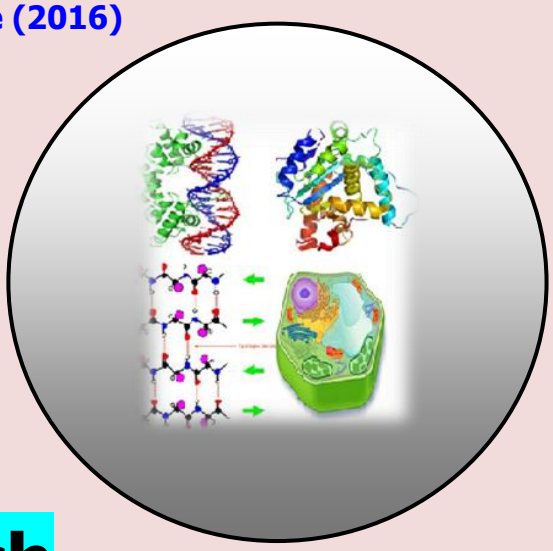
By

I. Rhiate Moufouad, S. Sadek, M. Guebas, Asmae Rayhani, Kh. Elkharrim and D. Belghyti

ISSN 2319-3077 Online/Electronic
ISSN 0970-4973 Print

UGC Approved Journal No. 62923
MCI Validated Journal
Index Copernicus International Value
IC Value of Journal 82.43 Poland, Europe (2016)
Journal Impact Factor: 4.275
Global Impact factor of Journal: 0.876
Scientific Journals Impact Factor: 3.285
InfoBase Impact Factor: 3.66

J. Biol. Chem. Research
Volume 35 (2) 2018 Pages No. 680-687



Journal of Biological and Chemical Research

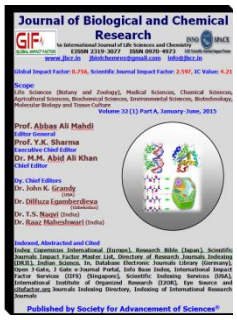
An International Peer Reviewed / Referred Journal of Life Sciences and Chemistry

Indexed, Abstracted and Cited in various International and National Scientific Databases

Published by Society for Advancement of Sciences®

J. Biol. Chem. Research. Vol. 35, No. 2: 680-687, 2018
(An International Peer Reviewed / Refereed Journal of Life Sciences and Chemistry)
Ms 35/02/9945/2018

ISSN 2319-3077 (Online/Electronic)
ISSN 0970-4973 (Print)



http:// www.sasjournals.com
http:// www.jbcr.co.in
jbiolchemres@gmail.com

RESEARCH PAPER

Received: 12/08/2018 **Revised: 06/09/2018** **Accepted: 10/09/2018**

Study of the Physicochemical and Bacteriological Quality of the Boukhalef - Tangier Water Table (Morocco)

I. Rhiate Moufouad, S. Sadek, M. Guebas, Asmae Rayhani, Kh. Elkharrim and D. Belghyti

Laboratory OF Environment and Renewable Energy, Faculty of Sciences, Ibn Tofaïl University, Kenitra, Morocco

ABSTRACT

In recent years, the different climate projections carried out in Morocco show that an increase in temperature, evaporation and a decrease in precipitation, consequences of the effects of climate change, inducing a global water deficit, estimated by 2016 to 2030 Such a deficit, amplified by the heterogeneity of the distribution of resources in the country, 7% of the territory, north-west, receives 51% of the rainfall, is likely to impact negatively, and in a sustainable way of socio-economic development of the country.

Our study focused on physicochemical evaluation of well water in the city of tangier. So we chose 13 water harvesting collectors. The well waters studied have average nitrite concentrations above the 0.1 mg / L standard, according to the World Health Organization (WMO). The very high presence of the indicator germs of fecal contamination probably constitutes a threat for the inhabitants who draw the water necessary for the majority of their needs from the water of these wells.

Keywords: Well, Analysis, Impact, Tangier and Morocco.

INTRODUCTION

In Morocco groundwater is an important part of the country's hydraulic heritage [Benyakhlef et al., 2011], due to its relatively easy operation.

Groundwater, often geologically protected, is exposed to agricultural, industrial or urban pollution. The Boukhalef Tangier water table represents the main water resource of the region. Groundwater pollution is one of the most worrying aspects and the use of these waters for food is à health hazard [Ministère de l'environnement du Maroc 2002].

The consumption of water contaminated by microorganisms is at the origin of epidemics. In addition, nitric pollution of drinking water can cause methemoglobinemia in infants and carcinogenic diseases in adults.

The aim of this paper is to evaluate the impact of the intensification of untreated wastewater discharges on the physicochemical and bacteriological quality of the water table waters of the Boukhalef-Tangier zone, this study is based on monitoring of 13 wells.

MEDIUM, METHOD AND MATERIAL

Medium of study

We used the same wells for analyzes of physicochemical and bacteriological parameters. The water points were chosen so as to have an overall picture of the Boukhalef water table (Figure 2).

Figure 1. Water sampling points of the Boukhalef water table of the city of Tangier. (www.maps.Google.fr).

Method of study

Our study is based on the monitoring of 13 wells (figure: 1), we carried out a total of 65 samples including 26 samples for physico-chemical analysis and 39 samples for bacteriological analysis. All these samples were taken in 13 wells numbered from 1 to 13 during the period September 2012 to August 2013. Each of these wells was sampled 5 during the entire duration of our work.

-For physico-chemistry: The 26 samples are distributed as follows:

-A sample from each well during the dry season.

- Another in the same wells during the rainy season, two samples taken from each well during the two main 2013 seasons.

- For bacteriological analysis: the 39 samples are distributed as follows:

A sample from each well during the dry season and two samples from the same wells during the rainy season, ie three samples from each well during the two main 2013 seasons.

Methods of study

PH, temperature, electrical conductivity, and dissolved oxygen are determined on site using a "multi-parameter analyzer" Type CONSORT Model 535 and "Multi-Parameter Analyzer" Type HANNA HI 9828.

Determination of nitrites

The nitrites are determined according to the Zambelli reagent method by molecular absorption spectrophotometry according to Rodier, (1984).

Nitrate determination

Nitrates are assayed by molecular absorption spectrophotometry according to the method described by Rodier, (1984).

RESULTS AND DISCUSSION

Temperature

In the study area, the results obtained show that the degree of this temperature does not show large variations from one well to another (Figure 2), with a minimum of 20 ° C (wells P1, P5, and P9) and a maximum of 21.06 ° C (wells P13). These temperature values constitute a risk of thermal pollution for the receiving environment [3].

The results obtained during our study show that the average temperature of the water is below the WHO standard of 25 ° C.

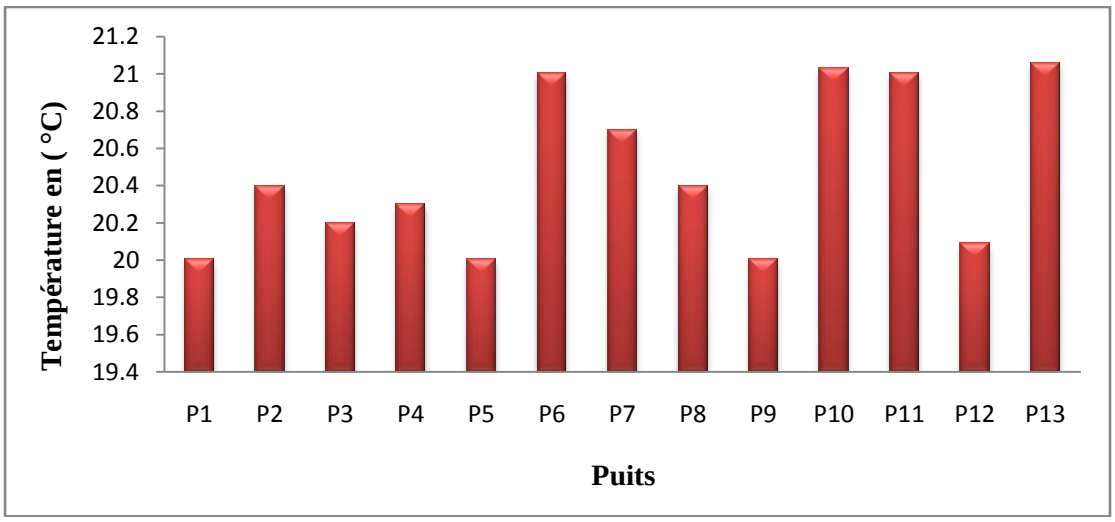


Figure 2. Spatial variations of mean values of temperature.

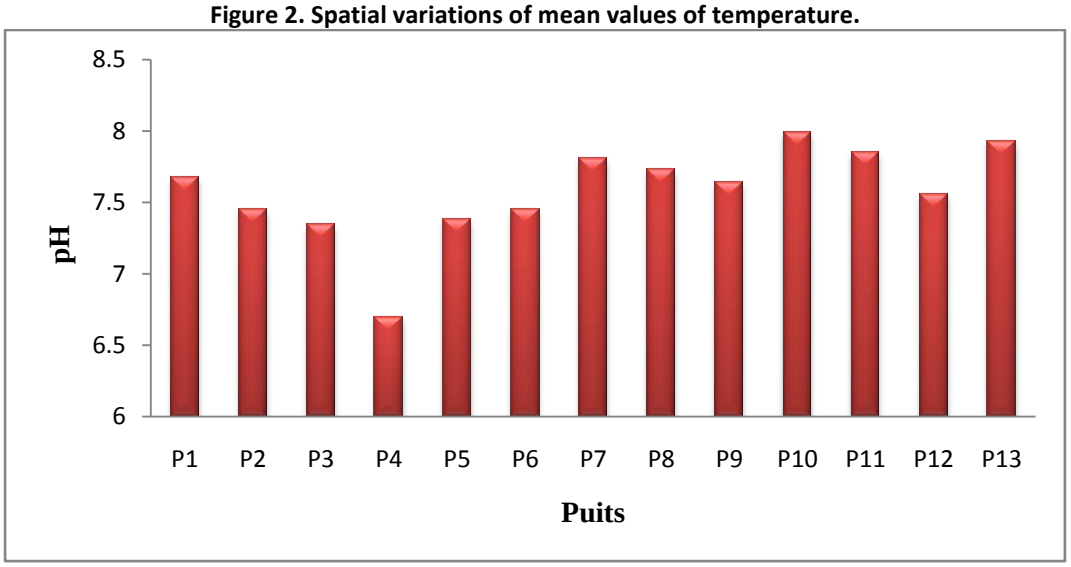


Figure 3. Spatial variations of mean pH values.

Indexed, Abstracted and Cited in Indexed Copernicus International and 20 other databases of National and International repute

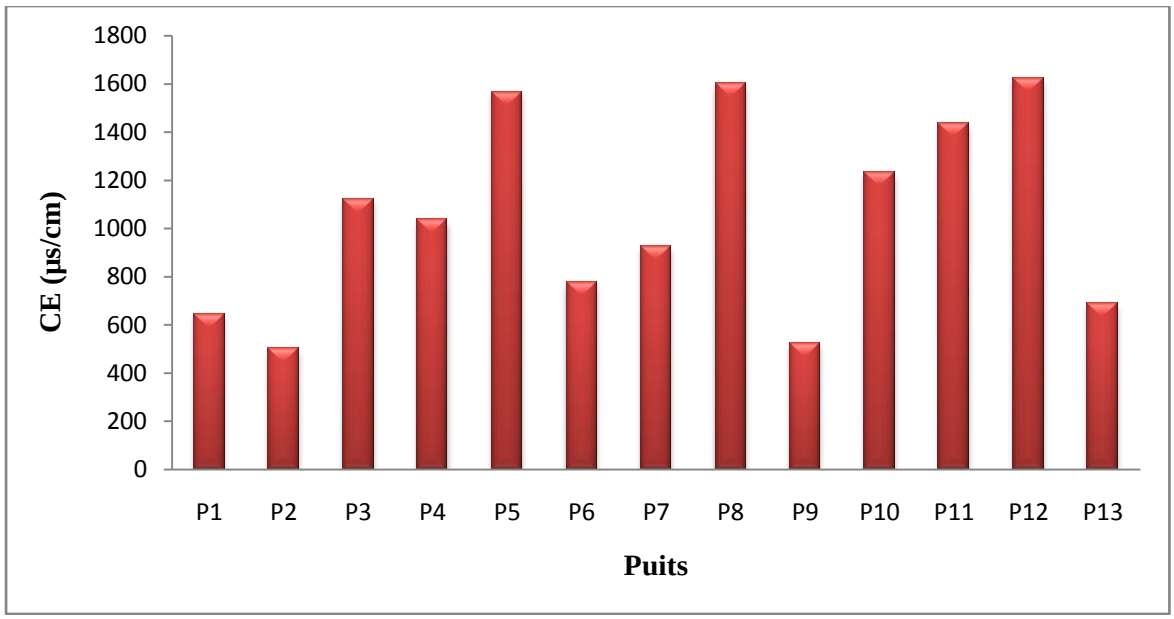


Figure 4. Spatial variations of mean values of electrical conductivity.

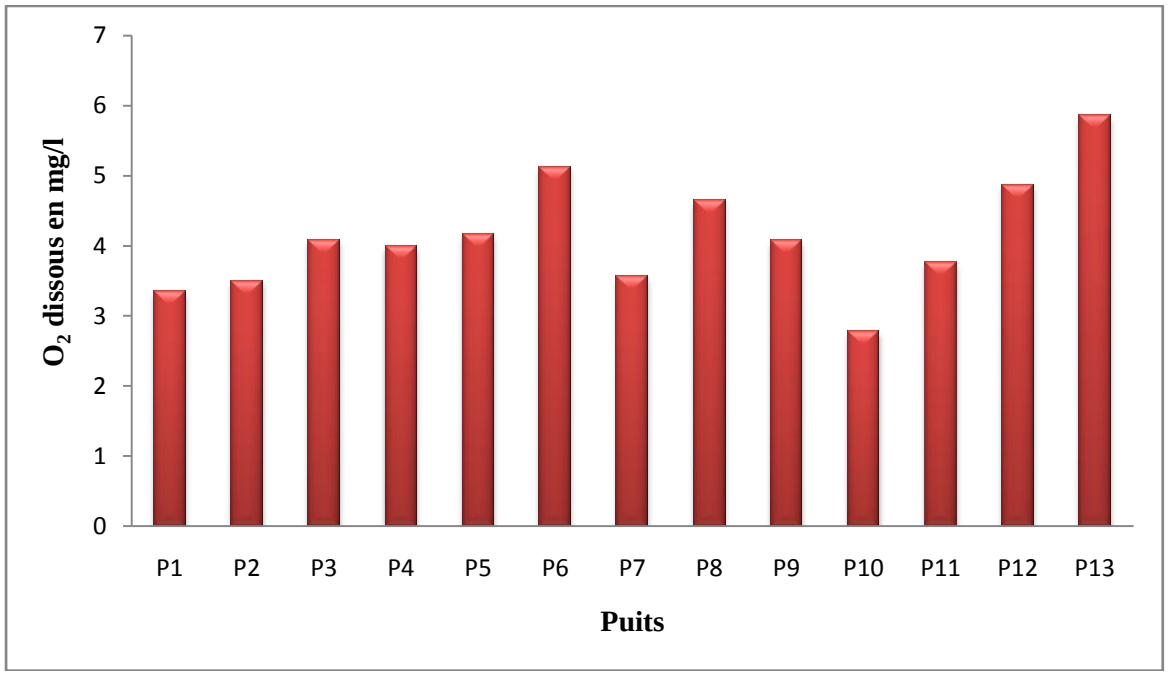


Figure 5. Spatial Variations of the Mean Values of Dissolved Oxygen.

PH

PH is therefore one of the most important parameters of water quality. It must be closely monitored during all treatment operations [4].

The pH values of the Boukhalef water table do not show any notable variations, with a minimum of 6.7 at the P4 well and a maximum of 7.99 at the P10 well (Figure 3), which indicates a slight alkalinity middle.

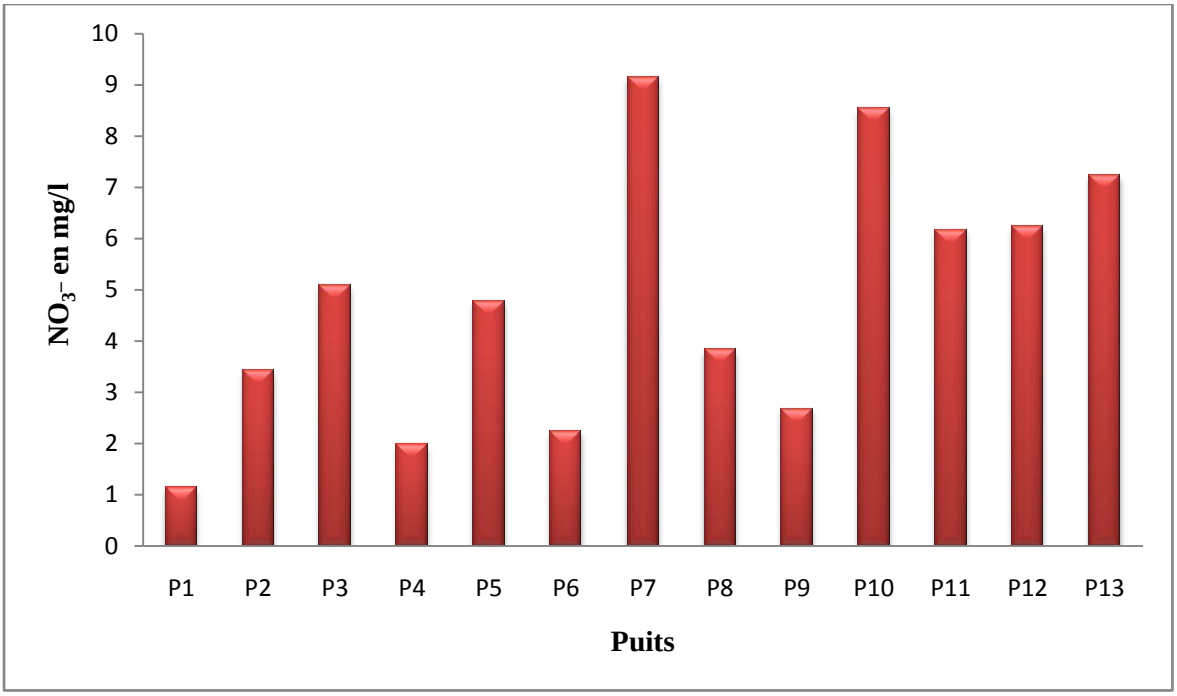


Figure 6. Spatial variations of mean values of nitrates.

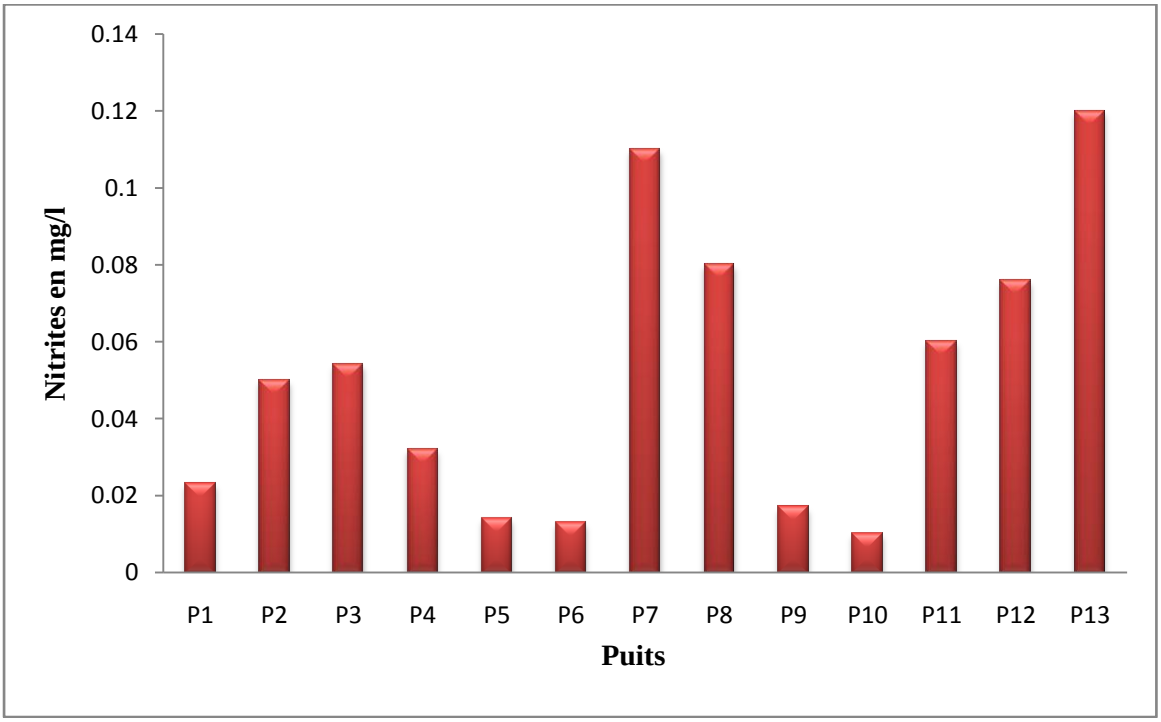


Figure 7. Spatial variations of Nitrite contents.

Indexed, Abstracted and Cited in Indexed Copernicus International and 20 other databases of National and International repute

Electrical conductivity

Conductivity gives an idea of the mineralization of a water and is therefore a good marker of the origin of a water. Indeed, the measurement of the conductivity makes it possible to appreciate the quantity of dissolved salts in the water, thus of its mineralization. The values recorded during the study period vary from 500 to 1621 µs/cm, the minimum recorded at well P2 and the maximum recorded at well P12 (Figure 4). This value is lower than that of Gumri et *al*., 2006.

The electrical conductivity depends on the loads of endogenous and exogenous organic matter, generating salts after decomposition and mineralization and also with the phenomenon of evaporation which concentrates these salts in water, it also varies according to the geological substrate crossed.

Dissolved oxygen

Dissolved oxygen (O_2) is very important because it conditions the state of several mineral salts, the degradation of organic matter and the life of aquatic animals. It plays a key role in the maintenance of aquatic life and in self-purification. Its presence in natural waters is mainly determined by the respiration of organisms, by the photosynthetic activity of the flora, by the oxidation and degradation of pollutants and finally by air-water exchanges. For all samples, dissolved oxygen shows significant variations from one point to another.

It ranges from 2.78 to 5.86 mg / l during the study period. The results obtained show that the wells are slightly oxygenated (Figure 5).

The average dissolved oxygen value of the well water analyzed is 4.13 mg / l. This recorded value is lower than the water grid intended for the production of the recommended drinking water 5 <O2 <8 [Capblancq, Thebault and Jrad, 1988].

This deficit of dissolved oxygen is the result of the high organic loads generated by the liquid discharges of the city of Tangier.

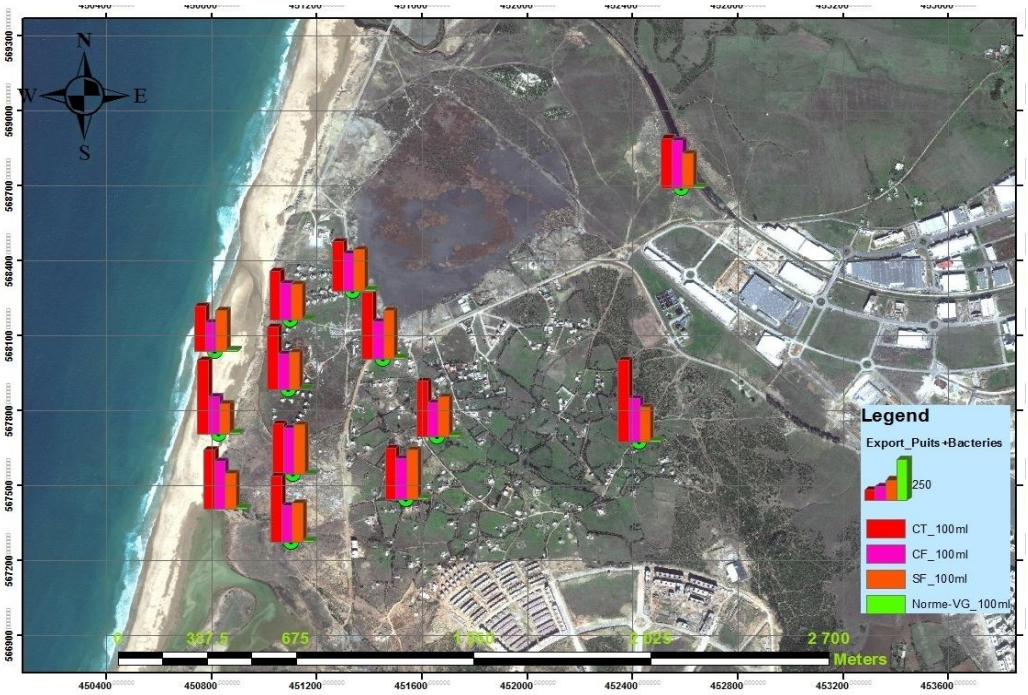


Figure 8. Concentration of microbial germs in the well of the Boukhalef - Tangier region.

Indexed, Abstracted and Cited in Indexed Copernicus International and 20 other databases of National and International repute

Nitrates

Nitrates are naturally present in groundwater at concentrations generally below 10 mg / l. Higher levels result mainly from point source (sink, leakage in the sewer system, etc.) or diffuse pollutants related to the application of nitrogen fertilizers and livestock effluents [Lecohu, Comoy, Guitard and Brabet 1991].

Nitrate levels can not legally exceed 50 mg / l in water intended for human consumption. This value is based on the risks of methaemoglobinaemia in infants [Derraz, Elalami, Atiki and Mhamdi, 2003, Rodier J., 1984, Benel Harkati, Elkharrim, Sadek, Belghyti, 2013].

The histogram of the nitrate contents (FIG. 6) shows a slight variation of these contents which oscillate between 1.14 mg / l (well P1) and 9.15 mg / l (well P7), but which remain below the value admissible by Moroccan standards (45 to 50 mg / l). As a result, the waters studied are not subject to the risk of nitrate pollution.

Nitrites

The nitrite contents (FIG. 7) vary from 0.01 mg / l (well P10) to 0.12 mg / l (well P13) during the study period, a peak of nitrite recorded at the well number 7 and 13 which exceed the normal rate of nitrite which is set at 0.1 mg / l according to WHO. This is because most of the wells in our study were without curbs, and are the most exposed to runoff.

For total coliforms (TC) (Table: 1 and Figure: 8), the average concentration is of the order of 364 CFU / 100 ml. The maximum average concentration is recorded at the P12 well (504 CFU / 100 ml). While the minimum average concentration is obtained at the P8 well (279 CFU / 100 ml).

Fecal coliform (CF) counts show that well water at the study area level has an average concentration of 243 CFU / 100 ml. The maximum average faecal coliform is recorded at the P13 well (299 CFU / 100ml) while the average minimum concentration is recorded at the P8 well.

As for faecal streptococci (SF), we noted that the average water concentration of wells in the Tangier region is around 246 CFU / 100 ml, with a mean maximum value recorded at the level.

CONCLUSION

The results of the physico-chemical analysis of water from the Boukhalef water table, have shown that pH, temperature, electrical conductivity and nitrates can be considered admissible and present no danger for consumption.

The well water studied has average nitrite concentrations above 0.1 mg / L according to the World Health Organization (WHO).

The very high presence of indicator germs of fecal contamination, as well as the presence of some other germs responsible for water-borne infections, may be a threat to the inhabitants who draw the water needed for most of the water. their needs from the water of these wells.

ACKNOWLEDGMENTS

Our thanks go to all the contributors who contributed actively to the realization of this study, particularly the technicians of the Errachidia station and the teams of our laboratory and we thanks go to all those who have actively contributed to conduct this study in particular: Laboratory OF Environment and Renewable Energy

Financing: none

Conflicts of interest: none.

REFERENCES

Benyakhlef, Naji, Belghyti and EL Guamri (2011). "Physicochemical Characterization of Industrial Wastewater Greater Agadir (Morocco), a case of an oil mill ". Sciencelib Volume 3 No. 110707.

Ministère de l'environnement du Maroc (2002). Normes marocaines, Bulletin officiel du Maroc, N° 5062 du 30 ramadan 1423. Rabat.

Rodier, J. (1996). L'analyse de l'eau « eau naturelle, eau résiduaire, eau de mer » (8éme édition) Paris : Dunode. 1434 pages.

Oulkheir S. (2002). Caractéristiques physico-chimiques et microbiologiques des eaux usées de la ville de Kenitra. Mémoire de 3ème cycle. Faculté des Sciences, Kenitra, 79p.

El Guamri. et Belghyti (2006). Étude de la qualité physico-chimique des eaux usées brutes de la commune urbaine de Saknia, rejetées dans le lac Fouarat (Kenitra, Maroc). Journal Africain des Sciences de l'Environnement, N° 1, Décembre.

Capblancq, Thebault and Jrad, (1988). Relation entre la lumière et la photosynthèse dans un réservoir mésotrophe (Pareloup): Variations saisonnières des paramètres, *Annls. Limnol.*, 24: 39-48.

Lecohu, Comoy, Guitard and Brabet (1991). Périodicité du phytoplancton dans un réservoir de moyenne profondeur : Le lac Pareloup (massif central, France) : un exemple de succession cyclique, *Annls. Limnol.,* 27 (3): 197-214. Francisco et Rey.

Derraz, Elalami, Atiki and Mhamdi (2003). Composition biochimique du zooplancton crustacé et broutage du phytoplancton et des protistes ciliés dans un réservoir récemment mis en eau (Sahela – Maroc), *Comptes rendus Biologie*, 329: 761-770.

Rodier J. (1984). L'analyse de l'eau naturelle, eaux résiduaires, eau de mer, 8ème Edition, Dunod, Paris, 1383p.

Benel Harkati, Elkharrim, Sadek, Belghyti (2013). Survey of Parasitologique Surface Water Quality (R'Dom Oued Sidi Kacem, Morocco), Journal of Environmental Protection Vol.4 No.11, Date: November 19.

Corresponding author: S. Sadek, Laboratory of Environment and Renewable Energy, Faculty of Sciences, Ibn Tofaïl University, Kenitra, Morocco
Email: SADEK_sanae@hotmail.fr

Indexed, Abstracted and Cited in Indexed Copernicus International and 20 other databases of National and International repute