



Research Journal of Pharmaceutical, Biological and Chemical Sciences

Physicochemical Analysis of Water of Boumerzoug River (Constantine-Algeria).

Rima Drissi*, and Chaabane Mouats.

Unit of Environmental Chemistry and Molecular Structural Research (UR CHEMS), Chemistry Department, University of Frères Mentouri Constantine 1, Algeria.

ABSTRACT

Wetlands today constitute a precious natural heritage to be preserved and restored from different types of pollutants produced by natural and by anthropogenic inputs. The present study was carried out to evaluate water quality of Boumerzoug river in Constantine city (Algeria). Physicochemical parameters were assessed. The results reveal high electrical conductivity levels reflect a quite strong mineralization. The results also showed high levels of phosphates and nitrites exceeding the recommended standards.

Keywords: pollution, assessment, surface water, water quality.

**Corresponding author*

INTRODUCTION

For the protection of public health, monitoring of physicochemical parameters of any body of surface or ground water is used to evaluate the impact of natural or human activities by comparing these parameters with standard values. The aim of this study is to assess the physicochemical quality of water of Boumerzoug river, which is the main effluent of Rhumel river in Constantine region (Algeria).

EXPERIMENTAL

Study Area

The Boumerzoug basin in the Northeastern Algeria is one of the sub-basins of the Kebir Rhumel. It covers an area of 1832 km². The water of this river is widely used for irrigation of agricultural fields, watering of dairy cattle, and for swimming during the summer; however the water quality of this river is doubtful because of pollution released from industrial, agriculture and urban areas located along the river. Boumerzoug river collects domestic sewages and also it is in confluence with the Hamimime river, which itself receives effluents of mechanical engineering industry.

Samples Collection

In order to assess the water quality of Boumerzoug river, water samples were collected from six selected stations, from March 2014 to February 2015. Water samples were collected in polyethylene bottles. Parameters like Temperature (T), pH, and Electrical Conductivity (E.C) were measured in the field. Other parameters like: Phosphate (PO₄³⁻), Nitrite (NO₂⁻), Nitrate (NO₃⁻), Sulphate (SO₄²⁻), Cyanide (CN), Calcium (Ca²⁺), Magnesium (Mg²⁺), Zinc (Zn²⁺), and Chloride (Cl) were analyzed in the same day of sampling. Mean values of physicochemical parameters of water samples are summarized in (table1).

Table 1: Mean values of physicochemical parameters

	March	April	May	June	July	October	November	December	January	February	WHO standard
T (C°)	10.3	16.2	22.9	24.9	26.9	22.3	13.3	11.3	10.3	16.7	20-30
PH	7.6	6.9	6.8	6.8	6.9	7.83	7.52	7.48	8.07	7.9	6.5-8.5
E.C (ms/cm ⁻¹)	0.45	0.76	0.74	0.45	1.71	1.6	1.42	1.59	1.08	1.54	-
PO ₄ ³⁻ (mg/L)	1.96	6.46	4.06	4.68	0.94	2.7	5.7	4.48	3.09	1.9	-
NO ₃ ⁻ (mg/L)	18.2	19.3	13.3	10.5	7.4	9.18	5.2	3.4	6	6.2	50
NO ₂ ⁻ (mg/L)	0.23	2.06	0.39	0.26	0.42	0.50	0.76	0.38	1.27	0.76	3
SO ₄ ²⁻ (mg/L)	300	299.3	637.3	328.3	337.2	380.3	438.8	415.8	293.3	319.2	500
CN (mg/L)	0.013	0.015	0.018	0.019	0.012	0.015	0.018	0.014	0.03	0.012	0.05
Mg ²⁺ (mg/L)	179.6	161	198.2	250.7	65.6	62.4	49.7	85.03	69.6	56.87	50
Ca ²⁺ (mg/L)	179.7	179	141.5	115	139.7	116.7	136	114.7	133.8	151.3	75
Zn ²⁺ (mg/L)	1.59	0.185	0.106	0.1	0.105	0.106	0.408	0.09	0.147	0.217	3
Cl (mg/L)	212.3	233.1	239.5	247.02	240.6	232.5	221.8	256.5	231.9	189.3	200

RESULTS AND DISCUSSION

Temperature

Temperature values during this study ranged between 9 and 27°C. Temperature of water is related to the climate of the region and it below the recommended limit (30°C).

Hydrogen Ion Concentration (pH)

The pH of a water body is very important in the determination of water quality since it affects other chemical reactions such as solubility and metal toxicity [1]. pH values ranged from 6.4 to 8.2. According to WHO standards, pH of most natural waters is between 6.5 and 8.5.

Electric Conductivity (E.C)

Conductivity estimates the amount of dissolved salts in aquatic ecosystems [2]. Electric conductivity values ranged from 0.11ms.cm^{-1} and 2.08ms.cm^{-1} . The data showed a high average of conductivity. It may be attributed to the elevated salinity and high mineral content in all sampling sites [3].

Phosphate

Phosphorus has been considered as a key element causing eutrophication, phosphates values ranged between 0.1 mg/L and 16.8 mg/L. High concentrations of phosphate in Boumerzoug river can be explained by the untreated discharges of wastewater from industrial units and neighboring communities or the leaching of Agriculture soils (phosphate fertilizers).

Nitrate

The main sources of nitrate in water are the excessive use of chemical fertilizers and the discharges of municipal and industrial wastewaters [4]. Nitrate concentrations in our samples were comprised between 0.62 and 40.9 mg/L. the water is within the maximum permissible limit of 50 mg/L.

Nitrite

Nitrite is a toxic element. Nitrite concentrations in Boumerzoug river vary between 0.03 and 3.69 mg/L. The results showed very high levels of nitrite, this can be attributed to the untreated discharges from industrial units located next to this course of water.

Sulfate

The values of sulfate ranged from 22 mg/L and 1290 mg/L. Industrial discharges and agricultural activities can be the reasons of the high values of this parameter.

Cyanide

Cyanide is a very toxic compound released in the environment through the effluents of industrial activities such as metal plating, electronics, photography, coal coking, and plastics [5]. Cyanide values ranged from 0.033 and 0.006 mg/L. Low concentrations of cyanide indicate that industrial activities have no effect on pollution of the river with cyanide.

Zinc

For the entire study, we recorded very low values of zinc (0.09 mg/L-0.46 mg/L), indicating non pollution status of the Boumerzoug river with this element [6].

Magnesium and Calcium

Magnesium value in Boumerzoug river ranged from 2.8 mg/L to 343 mg/L. While Calcium amount reached a maximum of 287 mg/L and a minimum of 16 mg/L. Calcium and magnesium depend essentially on the nature of the traversed field.

Chloride

Chloride is a component of salt, is one of the common anions found in freshwater and thus chloride levels are directly related to conductivity [7]. Chloride values in this study were ranged between 333 mg/L and 63.9 mg/L. Chloride concentration in water depends on the traversed field.

CONCLUSION

The degradation of surface water quality is one of the important environmental problems caused by industrial, agriculture and urban activities which considered as the principal source of declining water resources quality. With the aim of assessing Boumerzoug river water quality, a study of bacteriological and physicochemical parameters was carried out on this stream; compared with WHO standards; the level of pollutants varies from sampling point to another. The pollution of Boumerzoug river can be attributed to agricultural runoff, and industrial activities especially the levels of nitrites and phosphates.

ACKNOWLEDGEMENT

Authors are grateful for the technical help they received from Miss S. Farhi, and we thank the support provided by the administration of Sonacome (CPG), Ain Smara-Constantine.

REFERENCES

- [1] Agbaire PO, Obi C. J Appl Sci Environ Manag 2009; 13: 55 – 57
- [2] Waziri M, Akinniyi JA. and Ogbodo OU. American J Sci Industr Res 2012; 3: 99-102.
- [3] Mukhtar F, Ahmad Bhat M, Bashir R, Chisti H. J Mater Environ Sci 2014; 5: 1178-1187.
- [4] Shrimali M, Singh KP. Environ Poll 2001; 112: 351-359.
- [5] Mirizadeh S, Yaghmaei S. and Ghobadi Nejad Z. J Environ Health Sci Eng 2014; 12.
- [6] World Health Organization (WHO), Guidelines for drinking water quality. World Health Organization, Geneva, Switzerland 1993.
- [7] Sharma, JN, Kanakiya RS, Singh SK. Limnological. International Journal of Innovative Research in Science, Engineering and Technology (IJIRSET) 2015; 4.