

# Space evolution of phosphorus distribution in Oued Boumerzoug sediments

Sarah Azzouz<sup>1</sup>, Smaine Chellat<sup>2</sup>, Chahrazed Boukhalifa<sup>1\*</sup>

<sup>1</sup>LPTE, Département de Chimie, Université Mentouri de Constantine

<sup>2</sup>Département de Sciences de la Terre, Université de Ouargla

\*chahrazed\_boukhalifa@yahoo.com

## II. STUDY SITE

**Abstract—** This work is an evaluation of fractionation and mobility of phosphorus in sediments taken along Oued Boumerzoug from El-Khroub until the junction of Oued Rhumel in Constantine city. Successive extractions were applied in order to evaluate the distribution of phosphorus in the fractions: exchangeable, bound to oxyhydroxides; bound to calcium and residual. The obtained results show that the most mobile fraction does not exceed 2% of the total phosphorus. The fraction bound to calcium is the most important; the phosphorus contents in this fraction vary from 365 to 664 mg/kg. The contribution of the various fractions in the retention of phosphorus follows the order: exchangeable < residual < oxyhydroxides < related to calcium. Along the Oued, the fraction bound to calcium decreases; the other fractions are more stable.

**Keywords—:** phosphorus; mobility; sediment; Oued Boumerzoug

## I. INTRODUCTION

In aquatic environment, phosphorus is not toxic but an excessive quantity can be harmful by involving the eutrophication phenomenon [1]. In many studies, several authors showed that phosphorus could be trapped in the sediment, and under certain conditions it salted out in the water column [2]; [3]. Thus, it is important to estimate the bioavailability fraction responsible of alga proliferation in the ecosystem. The objective of this study is the evaluation of the various phosphorus species in the sediments of Oued Boumerzoug located in the northeast of Algeria.

The Oued Boumerzoug is an affluent of oued Rhumel. It is born from the junction of Oued El Kleb and Oued El Meleh, at about 25Km in the south of Constantine. It receives various oueds; the most important is Oued Hamimime [4].

## III. MATERIAL AND METHODS

Sediments samples were taken at four stations along the Oued from the exit of El-Khroub until the confluence with Oued Rhumel in Constantine city. Sampling was carried out using a peel. The samples were kept in plastic bags and transported to the laboratory where they were dried at 40°C and sieved using 0.215 mm mesh then stored until use.

pH and electrical conductivity were measured in the suspensions formed with distilled water. Inorganic phosphorus was extracted by HCl (1M). The fractionation of phosphorus in the sediments was carried out according to the method of Hieltjes and Lijklema (1980) [5]. The phosphorus concentrations were determined by the molybdate method by using a spectrophotometer UV-1650PC Shimadzu.

## IV. RESULTS AND DISCUSSION

The results of the physicochemical analysis are presented in table 1. Generally, the sediments samples have an alkaline pH.

The second sample (B) has the higher pH and the less mineralization. The more important mineralization concerns the third sample (C), it exceeds 1000  $\mu\text{s}/\text{cm}$ . Along the Oued, a reduction in inorganic phosphorus is observed.

Table 1:

Physicochemical analyzes of oued Boumerzoug sediments.

Sédiment sample	pH	Electrical conductivity ( $\mu\text{s}/\text{cm}$ )
A	7.92	821
B	8.17	575
C	7.80	1076
D	7.90	704

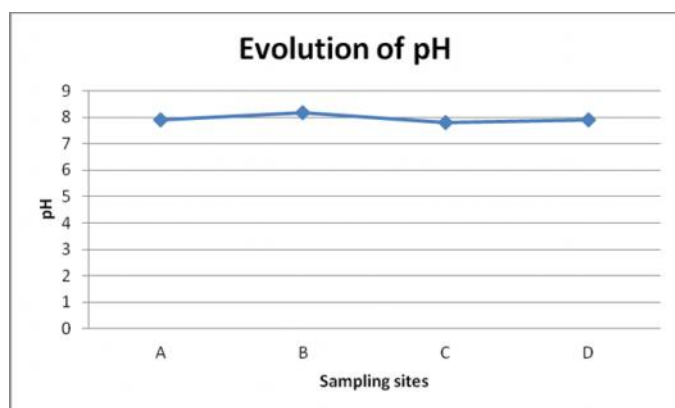


Fig1: Space evolution of pH along the Oued.

Phosphorus in Boumerzoug sediments is mainly inorganic. The calcium fraction is the more important. However, the exchangeable fraction is the less. This fraction represents only some percents of the total phosphorus. It doesn't exceed 14mg/kg. The phosphorus bound to oxyhydroxides fraction contents vary from 195.86 mg/kg to 244.12 mg/kg. The space evolution of this fraction reveals a relationship to the characteristics of the sediments. The lowest content is observed for the sediment B characterized by the highest pH and the weakest mineralization. Generally, the phosphorus fraction bound to calcium accounts for about 48% of the total phosphorus. It varies from 365 to 664 mg/kg. The most

important content is observed for the sediment sample characterized by lox mineralization. The phosphorus contents related to the residual fraction vary from 244.63 mg/kg with 331.61 mg/kg. Along the Oued, the highest concentration is recorded for the sample of the station C (331.61mg/kg) characterized by a high electric conductivity.

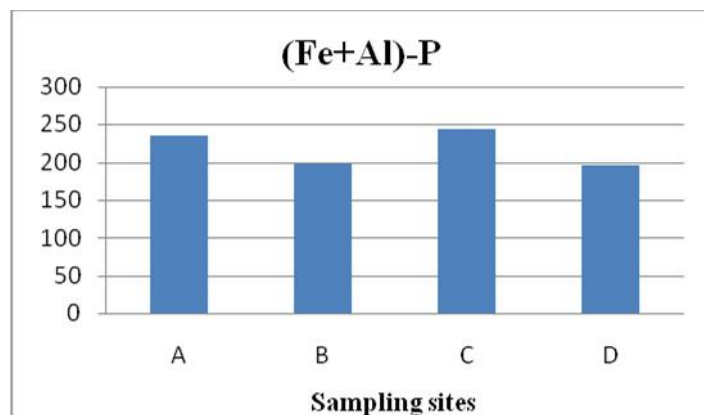


Fig2. Space distribution of (Fe+Al)-P (mg/kg) in sediments of Oued Boumerzoug.

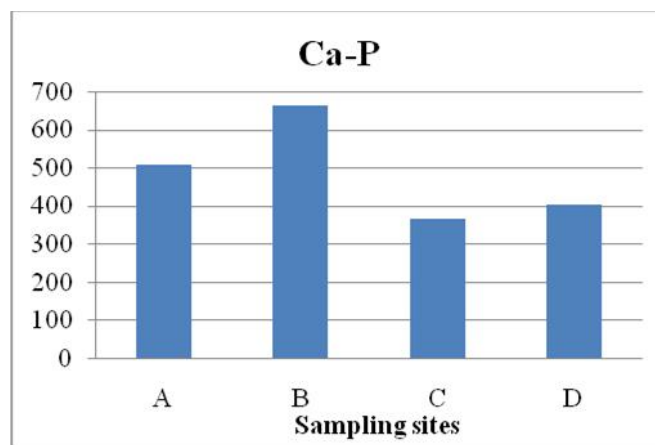


Fig3. Space distribution of (Ca)-P (mg/kg) in sediments of Oued Boumerzoug.

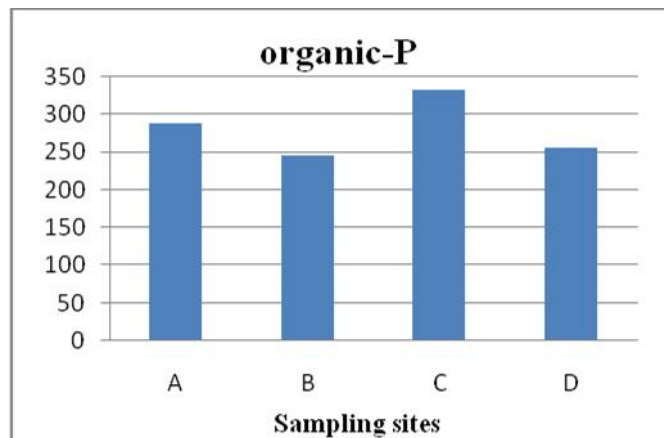


Fig4. Space distribution of inorganic-P (mg/kg) in sediments of Oued Boumerzoug.

## V. CONCLUSION

The sequential extractions of phosphorus in sediments sampled along oued Boumerzoug have been used to evaluate the distribution of phosphorus in the fractions: soluble, bound to oxyhydroxides, bound to calcium. The obtained results showed the prevalence of the calcium fraction. The contribution of the various fractions in the retention of phosphorus in the sediments follows the order: exchangeable < oxyhydroxides < calcium. The bio-disponible phosphorus in oued Boumerzoug sediments represents about 23% of the total phosphorus.

## References

- [1] Gerdes P, Kunst S. (1998) Bioavailability of phosphorus as a tool for efficient P reduction schemes. *Water Sci. Technol.* 37(3):241–247.
- [2] Böstrom B. (1984) Potential mobility of phosphorus in different types of lake sediment. *Int. Rev. Ges. Hydrobiol.* 69:457–474.
- [3] Krom M. .D. and Berner R.A. (1980). The diffusion coefficients of sulfate, ammonium and phosphate ions in anoxic marine sediments. *Limnol.Oceanogr.* 25: 327-337.
- [4] Mebarki A. (1982) Ressources en eau et aménagement en Algérie - Les bassins hydrographiques de l'est. O.P.U. Alger
- [5] Hieltjes A.H.M, Lijklema L. (1980) Fractionation of inorganic phosphate in calcareous sediments. *J. Environ. Qual.* 9:405–407.