

CHARACTERIZATION AND DISTRIBUTION OF PHOSPHOROUS IN SEDIMENTS. CASE STUDY: KUNE VAINI LAGOON SYSTEM (LEZHA, ALBANIA)

Loreta Vallja^{1*}, Sonila Duka¹, Alma Shehu¹, Nevila Broli¹, Majlinda Vasjari¹

¹Department of Chemistry, Faculty of Natural Sciences, University of Tirana,
Boulevard Zogu 1, 1001 Tirana, Albania

*e-mail: loreta.vallja@fshn.edu.al

Abstract

Phosphorus (P) is often the limiting nutrient for algal growth in lakes, estuarine and some other waters and may limit marine productivity. Exchange with bottom sediments place an important role in making P available for algae and contributes, therefore to eutrophication. Phosphorus is found in several forms other than orthophosphate, the most readily form consumed directly by algae. Because the forms of phosphorus are constantly changing and recycling, it is necessary to measure various forms of phosphorus besides the total content. The aim of the present study was to investigate the spatial and seasonal distribution of different forms of phosphorus in sediments as well as the evaluation of pollution levels of phosphorus from one of the most important lagoon complex in Albania.

Sediments of Kune Vaini lagoon complex samples were collected at five stations of the Kune Vaini lagoon complex during September 2018 - March 2019, with a frequency of every two months. Samples were analyzed for their total phosphorus (P) concentration and P fractions such as: total, inorganic and organic P, and extractable NaOH and HCl acid (extractable, using a sequential extraction procedure (SMT protocol).

Obtained results showed that the total phosphorus in sediments was relatively high, ranged from 376.1 mg/kg to 515.6 mg/kg. This can be considered dangerous, because insoluble phosphorus forms undergo bacterial decomposition (mineralization) and the phosphorus could be transformed into the soluble orthophosphate to the water deteriorating the trophic state and the quality of the water. Inorganic phosphorus (IP) was the major constituent of the total extractable phosphorus, ranged from 164.9 to 427.6 mg/kg; apatite phosphorus (AP) was the dominant inorganic form, while non-apatite phosphorus (NAIP) was identified as the minor constituent. The average concentration of organic phosphorus in sediments was 127.3 mg/kg (46.3 - 197 mg/kg), and the percentage of organic phosphorus (OP) to total phosphorus (TP) ranged from 20 to 43%. The concentration of the different forms of phosphorus in sediments followed the order TP > IP > AP > OP > NAIP while the variation between the sampling stations as well as between the sampling periods estimated as standard deviation ranged between 18.19 mg/kg (NAIP) to 69.8 mg/kg (IP).

The results indicate that sediments of Kune Vaini lagoon complex were slightly contaminated by phosphorus according to the applied indices. Distribution of phosphorus forms in sediments are affected by several factors, such as sediment type, organic matter content, mineralization rate, water depth, redox condition and Ca, Al and Fe content.

Key words: *Phosphorus, Distribution, Sediments, Lagoon, Extraction.*