



“Gheorghe Asachi” Technical University of Iasi, Romania



MOSS BIOMONITORING OF ATMOSPHERIC DEPOSITION STUDY OF MINOR AND TRACE ELEMENTS IN THE CRN DRIM RIVER BASIN, NORTH MACEDONIA

Trajče Stafilov^{1*}, Robert Šajn², Ivana Mickovska¹, Claudiu Tănăselia³

¹Institute of Chemistry, Faculty of Natural Sciences and Mathematics, Ss Cyril and Methodius University in Skopje, Arhimedova 5, 1000 Skopje, North Macedonia

²Geological Survey of Slovenia, Dimičeva 14, Ljubljana, Slovenia

³INCDO-INOE 2000 Research Institute for Analytical Instrumentation (ICIA), Cluj-Napoca, Romania

Abstract

This study presents the results of the investigation of the deposition of various chemical elements in the air using mosses as biomonitors in the Crn Drim River Basin, North Macedonia. For this purpose, 41 moss samples were collected using a previously adapted sampling network. The content of 60 elements was determined by atomic emission spectrometry - inductively coupled plasma (ICP-AES) and inductively coupled plasma - mass spectrometry (ICP-MS). Nineteen elements (Al, Ba, Ca, Cd, Cr, Cu, Fe, K, Li, Mg, Mn, Na, Ni, P, Pb, Sr, Tl, V, and Zn) were analysed using ICP-AES, while the remaining twenty-nine (Ag, B, Bi, Br, Ce, Co, Cs, Dy, Er, Eu, Ga, Gd, Ge, Hf, Ho, I, La, Mo, Nd, Pr, Rb, Sc, Sm, Sn, Tb, Ti, Y, Yb, and Zr) were analysed with ICP-MS. Multivariate statistical analysis was applied to the present data. Factor analysis applied to the result from ICP-AES yielded 3 geogenic factors: Factor 1 includes Cd, Cu, K, and Zn; Factor 2 includes Ba, Mn, and Sr, and Factor 3 includes Al, Cr, Fe, Li, Mg, Ni, and V. Among the correlation factors of all analysed elements, two groups of elements show similar distribution: G1 (B, Ba, Ca, Cd, Dy, Er, Ga, Ge, Mg, Mo, Nd, Ni, Pb, Tb, Tl, V, Zn, and Zr) and G2 (Al, Br, Cr, Cu, Gd, Ho, I, K, Mn, P). The data obtained and the distribution maps for each element and the factors and groups indicate a lithogenic occurrence of the elements and low concentrations of potentially toxic elements in the study area.

Key words: air pollution, moss, biomonitoring, ICP-AES, ICP-MS, Crn Drim River Basin, North Macedonia

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