



"Gheorghe Asachi" Technical University of Iasi, Romania



HEAVY METALS AND GAMMA RADIOACTIVITY BIOACCUMULATION IN *Artemisia absinthium* L. GROWN ON A WASTE DUMP

Mioara Săndulache Rachieru¹, Maria-Ema Faciu¹, Irina Ifrim¹,
Ioana Stefanescu¹, Azlan Kamari², Marius Stamate¹, Iuliana Lazăr^{1*}

¹"Vasile Alecsandri" University of Bacău, Marasesti Str. 157, 600115, Bacău, Romania

²Universiti Pendidikan Sultan Idris, 35900, TanjongMalim, Perak, Malaysia

Abstract

In the current context of industrialization, chemical and radioactive pollution is a concern for environmental protection and interference with human health. Care for environmental protection also includes vegetation that grows spontaneously in potentially contaminated places, thus avoiding illness among the population if consumed. The study area is located at 4.5km S-SE from downtown Bacău City, Romania and is the result of the manufacture of H₃PO₄ through the wet method. In this study, the concentrations of cadmium (Cd), lead (Pb), and copper (Cu) in soil, and in *Artemisia absinthium* L. (root and aerial part) medicinal plant that grows spontaneously in a polluted area, respectively the phosphogypsum landfill from Bacău, were evaluated for two consecutive years, 2014 and 2015. The main purpose of this paper is to investigate the level of bioaccumulation in plants and soil concentrations immediately after definitive ending of the commercial activity of Amurco SA Bacău located in the southern industrial area of the city and 10 years after ending of the dumping of the phosphogypsum storage. The obtained results were compared with the reference values according to the legislation on environmental pollution assessment. The average values obtained for soil Cd concentration are close to the normal values for samples taken from the phosphogypsum landfill, respectively 1 mg/kg in both studied years. However, some values for Cd in the soil were above the normal value, respectively 1.227 mg/kg in 2014 and 2.665 mg/kg in 2015. We note that in 2015, unlike in 2014, thus evidencing the effect of accumulation over time, the presence of values above the normal value also in the case of Cd in the soil (33.034 mg/kg) and in the case of Pb in the soil (34.117 mg/kg). The concentration of heavy metals (Cu, Pb and Cd) in the plant material harvested in 2014 and 2015 has exceeded the maximum concentration recommended by the Codex Alimentarius Commission (CAC) for most samples. Also, the values for γ radioactivity bioaccumulation factors are up to four times higher in the roots than in the aerial parts. In terms of biometric parameters, there was observed a strong direct correlation between the length of the aerial parts and level of gamma radioactivity in soil samples at both depths. The results registered for the plants grown on the top of the landfill show that the high values of heavy metals bioaccumulation degree from the aerial parts can be caused by adsorption of particles from the air. Thus, it can be concluded that even if the influence of the phosphogypsum landfill is only local, a monitoring program of aerial transport is needed.

Key words: aerial parts, bioaccumulation, phosphogypsum, radioactivity, root, spectroscopy

Received: December, 2016; Revised final: March, 2017; Accepted: March, 2017

* Author to whom all correspondence should be addressed: e-mail: ilazar@ub.ro; Phone: 0040740029860