

Air Radioactivity Monitoring by Higher Plants

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Plants represent an important link in transport and distribution of radionuclides, heavy metals, and other pollutants in the environment and are often used as biomonitors of atmospheric pollution. In this paper, two deciduous tree genera, linden (*Tilia tomentosa* L. and *Tilia cordata* Mill.) and chestnut (*Aesculus hippocastanum* L.), were analysed as biomonitors of radionuclides in air. The study was conducted in an urban area (the city of Belgrade, Serbia), from 2002 to 2009. The activities of radionuclides in soils, tree leaves and aerosols were determined on an HPGe detector (Cannberra, relative efficiency 18 %) by standard gamma spectrometry.

The mean activities of ¹³⁷Cs, ⁴⁰K, and ²¹⁰Pb in soils were 34 Bq/kg d.w., 384 Bq/kg dw (dry weight), and 51 Bq/kg dw, respectively, while their mean activities in linden and chestnut leaves were 1.8 Bq/kg dw, 498 Bq/kg dw, and 46 Bq/kg dw, respectively. The mean ⁷Be activity in leaves was 125 Bq/kg dw. The activities in aerosols were of order 10⁻⁶ Bq/m³ for ¹³⁷Cs, 10⁻⁴ Bq/m³ for ²¹⁰Pb, and 10⁻³ Bq/m³ for ⁷Be.

The calculated "soil-to-leaves" transfer factors for ⁴⁰K and ²¹⁰Pb were 1.3 and

0.9, respectively. The transfer factor for ¹³⁷Cs was close to zero suggesting atmospheric deposition as the primary mode of ¹³⁷Cs accumulation in leaves. The ⁴⁰K activity in leaves decreased towards the end of the growing season, reaching around 70 % of the spring maximum. The concentrations of ²¹⁰Pb and ⁷Be measured in leaves were both higher in autumn than in spring. However, the ²¹⁰Pb activities increased throughout the growing season, while the ⁷Be activities reached the maximum in summer.

There were no significant differences in the radionuclides' activities between the different sampling sites and between the tree genera. A strong positive correlation for ²¹⁰Pb activities in linden leaves and in air during preceding months was obtained, suggesting that mature linden leaves could be used as biomonitors of recent exposure to ²¹⁰Pb. The seasonal pattern of the ⁷Be activity in leaves partly followed the seasonal pattern in aerosols, but no large positive correlation was found.

Keywords: tree leaves, biomonitors, radionuclides, urban air

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