The impact of road transport on the contamination of soils and plants by zinc, copper and iron

Wpływ transportu drogowego na zanieczyszczenie gleb i roślin cynkiem, miedzią i żelazem

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Contamination of soil are widely recognized as one of the main causes of degradation, both in rural and urban areas. The main contaminants including heavy metals and natural components of the lithosphere, cause as a result of the development of civilization that their content in the different parts of lithosphere can greatly exceed the value considered natural. Traffic is considered to be one of the major sources of environmental pollution. It occurs as a result of fuel combustion and emissions, but also is a result of abrasion of the tires and wheels and brake, clutch and asphalt. Accumulation of heavy metals along the route depends on the traffic, distance from the road, terrain and way of using. The contamination by heavy metals also includes trace elements such as zinc (Zn), copper (Cu) and iron (Fe). The aim of this study was to evaluate the contamination of soil and plant by these micronutrients depending on the distance from roadway of two routes characterized by varying volume of the traffic and relationship between the content of total and individual fractions of the physico-chemical properties soils and their content in the plants. The study included two transport routes: E30 – Warsaw–Poznań (town Mory) and E372 (location Zakręt). Sampling points were set at 5, 10, 20, 50, 100 and 200 m from the center of the roadway. The collected soil samples were collected from a depth of 0–20 cm and 80–100 cm of the designated points. The plant material: common goldenrod (*Solidago virgaurea*) were taken from the same locations. In order to determine the physico-chemical properties of soil, was performed the analysis of grain size composition of the soil, pH (in H20 and 1 N KCl) and content of organic carbon in the soil was determined. Grain size distribution in the analyzed soil was determined by the method aerometric Casagrande with Prószyński modtfication. The pH of the tested soil was determined by electrometric method on the based on standard ISO 10390: 1997. Total carbon was determined by using an automated analyzer Shimadzu TOC - 5000. All soil samples taken for analysis were analyzed by sequential extraction Tessier method, which involves the separation of five fractions of heavy metals. Based on these results, it was found that the contents of studied micronutrients in the soil from both routes did not exceed the value permitted by law. Zinc was associated with fraction III and IV and was taken up by the plant. Copper in the upper layer was mostly associated with the residual and organic fraction, while only a small extent was connected to the mobile forms. Iron in the soils from E30 was mainly related to fraction III and IV, while in soils collected along the route E372 was mainly related to the fraction V.