

## ABSTRACT

### **Impact of rock dust on the phytoavailability reduction of copper, nickel and zinc from soils contaminated with these metals**

The purpose of research was to check the reaction of reed canary grass (*Phalaris arundinacea*) on soil contamination with copper, nickel and zinc, as well as on the applied addition of waste rock dust to the soil and its impact on the change of soil properties.

The research was carried out in the years 2011-2012, in concreted microplots of 1 m<sup>2</sup>, filled with sandy soil with simulated metals contamination. The rock dust was mixed with the soil to a depth of 20 cm. The experiment was carried out as two-factorial, in a complete randomization system, in four replications. The first factor was the type and level of soil contamination with metals, covering 10 objects: control without metals and three levels of copper contamination (Cu1-Cu3), nickel contamination (Ni1-Ni3) and zinc contamination (Zn1-Zn3). The second factor was soil remediation, including control without remediation and remediation with rock dust at a dose of 3 kg·m<sup>-2</sup>.

The yields of the aboveground part of the plant after each growing season and the root yield after the research were determined. In the plant samples, the concentration of the investigated metals, and in the aboveground parts also the concentration of macroelements were determined. Before starting the experiment and after each growing season, the concentration of Cu, Ni and Zn after extraction with 1M HCl, as well as the texture, organic carbon content, pH, hydrolytic acidity, sum of bases and sorption capacity were determined in the soil samples. Mineralogical and chemical composition of waste rock dust and its physical properties were also characterized.

The results indicate that reed canary grass, which was cultivated on soil contaminated with metals, well tolerated the excess copper in the soil up to about 250 mg·kg<sup>-1</sup>, nickel up to 140 mg·kg<sup>-1</sup> and zinc up to 560 mg·kg<sup>-1</sup>. The plant most easily accumulated zinc from the soil and transported it largely to the aboveground part. This indicates the possibility of using this grass for phytoextraction of zinc from the medium polluted soil with this element. The application of rock dust to the contaminated soil had reduced metals phytoavailability and changed their distribution in the plant between the roots and the aboveground part. The positive effect of adding dust to soil contaminated with copper, nickel and zinc, as an increase of

tolerance of reed canary grass to metals only appeared at a sufficiently high level of these elements in the soil.