

Effect of copper pollution on the content of trace elements in soil

Oddziaływanie zanieczyszczenia miedzią na zawartość pierwiastków śladowych w glebie

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The purpose of the study has been to determine the influence of increasing soil contamination with copper on the content of trace elements in soil. In order to reduce the effect of copper on its content as well as the concentration of other trace elements in soil, the following substances were introduced to soil: compost, bentonite and zeolite. Plant growing trials were carried out in a greenhouse, at the University of Warmia and Mazury in Olsztyn. Soil was polluted with copper as copper chloride in amounts of 0, 50, 100, 150 and 200 mg Cu · kg⁻¹ of soil. Maize (*Zea mays* L.) was the test plant. The experiments were performed in four series: with no added substances, and with a soil application of compost (3%), bentonite (2%) and zeolite (2% relative to the soil mass). Soil in each pot was additionally mixed with fertilizers, in quantities adjusted to the nutritional demand of maize. Having mixed each batch of soil accordingly with copper chloride, compost, bentonite, zeolite and fertilizing components, polyethylene pots were filled with soil and seeded with maize. During the whole experiment, the soil moisture content was maintained at 60% of field water capacity. Maize was harvested after tasseling and then soil samples were collected.

The soil contamination with copper and the application of neutralizing substances has significant effects on the soil content of copper and other trace elements. In the series with no neutralizing substances, copper pollution mainly caused a very high increase in the soil content of copper and a smaller one in the amount of cadmium. In the same series, the highest doses of copper led to a decrease in the content of cobalt, nickel, zinc, manganese, iron and lead. All the applied neutralizing substances were effective, lowering the soil content of copper as well as cadmium, chromium and, to a much lesser degree, lead and manganese. It is worth noticing that the effect of zeolite was much stronger than that of bentonite or compost. Compost acted similarly with respect to cobalt and nickel, while zeolite produced a similar effect on zinc and iron and bentonite had a comparable influence on the soil accumulation of zinc. In turn, bentonite and zeolite contributed to an increase in the soil content of nickel and cobalt.