

Zn, Cu, Mn and Ni contents in three soil horizons in long-term fertilization experiments in Skierniewice

Zawartość Zn, Cu, Mn i Ni w 3 poziomach genetycznych gleby w trwałych doświadczeniach nawozowych w Skierniewicach

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In 2015, soil samples were taken from long-term fertilization experiments after 90 years of different mineral (Ca, CaNPK, NPK, CaPK, CaPN, CaKN) and organic fertilization regimes. The samples came from three soil horizons (Ap, Eet, and Bt) in three crop rotation systems (potato monoculture, crop rotation without manure and without legumes, and five-field crop rotation: potatoes on 30 t/ha manure, barley, lupine, wheat, rye). The samples were analyzed for zinc, copper, manganese and nickel. The amounts of these microelements were determined by the ASA method in 1 mol HCl.

In arbitrary rotation without manure and without legumes, in the humus layer, the highest amounts of Zn and Ni were found under the CaKN treatment, Mn under NPK, Cu under CaPN, and the lowest amounts of Cu under CaPK, and of the other microelements under CaNPK. Across the soil profile, the highest amounts of manganese and zinc were determined in the humus layer, and of nickel and copper in the Bt horizon.

In five-field crop rotation, the highest amounts of Ni and Cu were obtained in the Bt horizon, and of nickel and zinc in the arable layer (Ap). The lowest amounts of all the analyzed microelements were obtained in the eluviation horizon Eet. In the humus layer, the highest amount of nickel was obtained under the Ca treatment, of manganese and copper under CaNPK, and of zinc under CaNP. The lowest amounts of nickel and copper were obtained under the CaPK treatment, of manganese under CaKN, and of zinc under CaNPK. In the Bt horizon, the highest amounts of Ni and Mn were determined in the control (Ca), and of Cu and Zn under NPK; the lowest amounts of Mn were obtained under CaKN, and of the other microelements under CaPK.

Across the soil profile under potato monoculture, the highest amounts of Mn and Zn were obtained in the humus layer, and of Ni and Cu in the Bt horizon. In the humus layer, among the six fertilization combinations, the highest manganese content was determined in the NPK combination, and for the other microelements in the control (Ca). The lowest amounts of all the microelements analyzed were obtained in the CaPK combination without nitrogen. In the Bt horizon, the highest amounts of Ni and Mn were obtained under the treatment without phosphorus (CaKN), of copper under NPK, and of zinc in the control.

On average across the soil profile, the lowest amounts of the analyzed microelements were obtained under monoculture. The highest Ni and Mn contents were determined under five-field crop rotation. The Zn and Cu contents, on average for the soil profile, were similar in all three crop rotation systems. Under all crop rotations, the highest amounts of manganese and zinc were obtained in the arable layer (Ap), whereas the amounts of copper and nickel were the highest in the Bt horizon.