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Faculty of Agriculture



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**Potentially toxic elements uptake and translocation by alfalfa
under the influence of rhizobium strains**

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Abstract

Bacteria living in symbiosis with alfalfa can reduce the uptake of potentially toxic elements (PTE) from the soils with their increased content by different mechanisms. In this research, the degree of uptake and translocation of PTE, as well as alfalfa yield in the second year of cultivation (third cut) was analysed. The experiment was set up using thirteen rhizobia strains and 2 controls (without mineral N, with mineral N addition). The plants were grown in a glasshouse on Fluvisol soil type, with favourable basic physical and chemical properties and a slightly increased total Ni content of 58 mg/kg. The results showed that the values of all elements in alfalfa shoot were among the usual concentrations for plants (the average Ni content was 3 mg/kg). The significantly higher concentrations of elements were retained in the roots; therefore, the translocation factor (TR) was 0.03-0.47, and the value of TR increases in the following order: Fe, Co, Cr, As, Cd, Pb, Ni, Cu, Mn, Zn. The application of strains influenced significant differences in the content of all elements in the roots. Certain strains reduced the PTE content in the shoot compared to the controls, but the differences were not significant (except for Co). The shoot dry weight of alfalfa had higher values in the treatments inoculated with strains 224, 4148ss, 218, while the root dry weight was not significant different between treatments. The removal of elements by the shoot mass was the largest in the controls (As, Co, Cu, Fe, Mn, Zn, in both controls; Ni and Cr in the control with N). The removal of Ni was reduced by the application of strains 4193cs, 10-2BM, L3Si, 224, as well as the majority of other elements, especially Cr, Co and Fe. Since the effectiveness of bacterial strains depends on many factors, further research will enable more precise conclusions.

Key words: Medicago sativa, rhizobia, soil, potentially toxic elements

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