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***Alyssum murale* in Albania and its potential for the management of soils high in available nickel**

***Alyssum murale* en Albanie et ses possibilités pour la gestion du sol à teneur élevée en nickel disponible**

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This work was conducted to determine the potential of Ni-hyperaccumulator plants to deal with soils containing high levels of available Ni. A collection of soil and plant samples was made in Albania, a country rich in serpentine sites to select Ni-hyperaccumulators and collect mature seeds. Soils were sampled from the upper soil horizon of undisturbed serpentine area, mine spoils and industrial sites. Metal content was determined in each sample. Then, a selected *Alyssum murale* was grown on a serpentine soil (1300mg Ni kg⁻¹) and two agricultural soils (24 and 32 mg Ni kg⁻¹) in pot experiments. Available soil Ni was labelled with ⁶³Ni, and total Ni and ⁶³Ni in plants were analysed after a 3-month period. The isotopic composition of Ni in plant (ICp) was then calculated. In parallel, isotopic exchange kinetics of ⁶³Ni²⁺ ions (Echevarria *et al*, 1996) were performed to determine the isotopic composition of Ni in soil solution (ICs). The E and L values, two parameters obtained from pot experiments and isotopic exchange kinetics to quantify the available soil nickel were also calculated.

Results showed that Ni in soil was present at high concentration in most sites. Other metals, such as Cr, Cu, Zn and Pb were also present at high concentration in industrial sites. Among the plants, *Alyssum markgrafii* in the north, and *Alyssum murale* in the south-eastern serpentines exhibited a concentration of 1.26 and 0.85% Ni in dry matter respectively. In the species *Herniaria hirsuta*, a serpentine plant, concentrations of 808 mg kg⁻¹ Ni, and 275 mg kg⁻¹ Cr in dry matter were recorded. Others taxa (*Filago*, *Inula*, *Picris*, *Galamintha*, *Marrubium*, *Lotus*, *Ononis* and *Xeranthemum*) from serpentines had a high but not exceptional Ni content.

Results from pot experiments showed that the development of *Alyssum murale* was higher on agricultural soils than on the serpentine soil. The isotopic composition of Ni taken up by plants of *Alyssum murale* was identical to the isotopic composition of Ni in the soil solution, demonstrating that the hyperaccumulator took up its Ni only from the pool of isotopically exchangeable Ni in soil. The L value determined after two months was not significantly different from the E value deduced from the isotopic exchange and extrapolated to the same period confirming that the isotopic exchange kinetic method can be used to determine the available soil Ni. *Alyssum murale* depleted 5 to 25% of the exchangeable Ni of agricultural soils and only 1.5% of the serpentine soil. Hence, the Ni-hyperaccumulator *Alyssum murale* was able to reduce strongly the available soil Ni and could be used routinely to manage Ni-contaminated soils.

References :

Echevarria, G., Klein, S., Fardeau, J.C. et Morel, J.L. 1997. Mesure de la fraction assimilable des éléments en traces du sol par la méthode des cinétiques d'échange isotopique : cas du nickel. C.R. Acad. Sci. Paris, t.324, série II a, p. 221-227.

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