Comparison of *Brassica napus* and *Alyssum serpyllifolium* regarding uptake of platinum group elements, determined by ICP-OES

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**INTRODUCTION**

With the introduction of platinum group elements (PGEs) for the reduction of pollutant exhaust fumes emissions such as carbon monoxides, nitrogen oxides and hydrocarbons, not only air quality improved but also PGE concentrations in the environment increased significantly over time. Consequently special interest regarding their fate in biological samples like soils adjacent to roads and the biosphere was drawn to this subject. Although the metals are emitted as particles at first (along with particles of the so-called “wash coat” of the vehicle), environmental transformations are believed to lead to the formation of bioavailable species of the elements, resulting in the accumulation in soil, sediments and plants. Due to these findings concerns arose considering the possible impact of PGEs on human health once reaching the food chain. Still only little is known about the mobility and uptake of PGEs in the environment, which calls for further investigations.

Thus, for the acquisition of more insight regarding PGE’s behaviour in the vegetation, uptake by *Brassica napus* and two populations of *Alyssum serpyllifolium* in various contamination levels as well as their root’s morphology were analysed and compared in our work.

**PLANT EXPERIMENTS**

Plants: *Brassica napus* (B), *Alyssum serpyllifolium* (A)

Hydroponic set-up:
- pre-cultivated plants
- pH 6 (MES), pH 7 (BES)
- various PGE concentrations
- contaminated for four weeks
- replacement of solutions: twice a week

After harvesting:
- division into upper and lower parts (roots, shoots)
- washing with 0.05 M CaCl2 and distilled H2O
- drying at 60°C for several days
- determination of dry weight, grinding (for analysis)

**RESULTS**

Table I

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<tr>
<th>ICP-OES</th>
<th>RF-power [W]</th>
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Plasma gas flow rate [L min⁻¹]: 12
Radial viewing height [mm]: 11
Nebulizer flow rate [L min⁻¹]: 0.7
Auxiliary flow rate [L min⁻¹]: 0.6
Sample flow rate [mL min⁻¹]: 0.8
Integration time [sec.]: 10
Replicates: 5

* Matrix-matched calibration

Regarding the Ni-accumulating and excluder populations of *A. serpyllifolium*, the comparison displayed an enhancement of element concentrations in the plant of ~ 5% to 80% and even 100% depending on the analyte and contamination level. The highest PGE level (5 mg L⁻¹) twice a week) for instance, pointed out an enhancement of the elements (depending on the chosen buffer solution) by 25 – 60% (BES) or 7 – 20% (MES). Comparing the effect of PGE addition in solutions of two different buffer systems revealed that the concentrations of the elements in the plants were higher for Pd in pH 6 (MES), while Pt and Rh were accumulated to a higher extent in the plants grown in pH 7 (MES) nutrient solutions. Data for the comparison of PGE concentrations in the roots of *B. napus* versus the two population of *A. serpyllifolium* are compiled in Table II, showing only little effect for Pt and Pd in pH 8 (MES), while Pt and Rh accumulation were higher in pH 6 solution, whereas Rh increased in solutions of pH 7 (BES).

In terms of root morphology, *B. napus* illustrated a usual expected increase of the average diameter (classes > 0.45), while the surface area (cm²) and root length (m) decreased with increasing metal contamination. The root sub-samples of *A. serpyllifolium* on the other hand, hardly showed any significant trend, apart from a marginal increase of root length and surface area.

**REFERENCES**


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