EXAFS analysis of Cd tolerance in Cd hyperaccumulating species

I. Arčon [1,2], K. Vogel-Mikuš [3], M. Regvar [3], P. Kump [2], M. Nečemer [2], A. Kodre [4,2],

[1]University of Nova Gorica, Vipavska 13, POB 301, SI-5001 Nova Gorica, Slovenia (iztok.arcon@p-ng.si)
[2]J. Stefan Institute, Jamova 39, POB 000, SI-1001 Ljubljana, Slovenia
[3]Biotechnical faculty, Dept. of biology, Večna pot 111, SI-1000 Ljubljana, Slovenia
[4]Faculty of Mathematics and Physics, Jadranska 19, University of Ljubljana, Slovenia

In some plant species as for example *Thlaspi* Cd absorption from polluted soils is found to be very efficient. Recently, *Thlaspi praecox* was shown to hyperaccumulate up to 5960 μg g^{-1} of dry weight (DW) of Cd under field conditions [1]. Cd^{2+} cations are extremely toxic even at low concentrations of a few μg g-1 DW. Such hyperaccumulating plants thus represent a threat to translocate Cd to the food chains. On the other hand they are a promising way for metal removal from polluted soil. More knowledge on metal accumulation and detoxification is needed to understand soil-plant interactions for the use of phytoextraction in practice. *Thlaspi praecox* was found to massively accumulate Cd not only in roots and leaves, but also in seeds (up to 1350 μg g-1 DW), without drastically affecting seed viability [2]. Micro-PIXE (proton-induced x-ray emission) localization study showed that Cd is mainly accumulated in the epidermis of cotyledons, away from photosynthetically active embryonic tissues.

In this study we use Cd K-edge EXAFS and XANES analysis of different organs (roots, shoots, leaves and seeds) of *Thlaspi praecox* to obtain information on the local structure around Cd cations bound in different plant tissues, in order to identify Cd complexes responsible for Cd immobilization. X-ray absorption spectra were measured at BM29 beamline of ESRF and C beamline of HASYLAB, DESY, Hamburg under EU Contract RII3-CT-2004-506008 (IA-SFS). Comparison of chemical coordination of Cd in different plant organs gives insight in detoxification mechanism and Cd transporters and/or antioxidant-based defence at the molecular level that contributes efficiently to Cd tolerance in hyperaccumulating species.

[1] K. Vogel-Mikuš, D. Drobne, M. Regvar, Environmental Pollution, 133 (2005) 233-242
[2] K. Vogel-Mikuš *et al*, Environmental Pollution, 147 (2007) 50-59