**P. Doubková: The role of arbuscular mycorrhizal symbiosis in plant performance under the specific edaphic conditions of serpentine soils**


## Summary

Serpentine soils represent a unique environment characterized by unfavourable physicochemical properties involving low calcium to magnesium ratio, increased concentrations of heavy metals, often also deficiencies of essential macronutrients, and low water-holding capacity. Under these adverse conditions, a considerable potential of arbuscular mycorrhizal fungi (AMF) to promote plant growth was hypothesized due to the importance of arbuscular mycorrhizal (AM) symbiosis for plant nutrition and alleviation of various types of abiotic stress. On a model host plant species, *Knautia arvensis* (Dipsacaceae), we examined: i) occurrence of AM symbiosis and species richness and composition of the native AMF communities; ii) role of AM symbiosis in plant growth, element uptake and drought stress tolerance; iii) edaphic differentiation in plant populations or in AMF symbionts under serpentine vs non-serpentine conditions.

Generally, *K. arvensis* plants showed lower frequency of mycorrhizal root colonization at serpentine compared to the non-serpentine sites. Adjacent serpentine and non-serpentine populations also differed in AMF species assemblages colonizing their roots. Both, species composition and richness of these AMF communities depended primarily on edaphic parameters of the native soils (pH value and nickel concentration for composition; pH value, and soil chromium and potassium concentrations for richness).

AM symbiosis showed an overall beneficial effect on *K. arvensis* growth, with the mycorrhizal growth dependence of host plants determined mainly by nutritional status of the soil, regardless of its serpentine vs non-serpentine character. In contrast, the identity and complexity of AMF inocula generally played a minor role in determining the extent of mycorrhizal growth and nutrient uptake promotion. In serpentine substrates, improved phosphorus acquisition and drought stress alleviation were likely the crucial mechanisms of the beneficial influence of AM symbiosis, instead of any substantial modifications in calcium and magnesium nutrition or nickel uptake. The phytotoxicity effect of nickel seemed to be even increased by AM symbiosis at considerably elevated nickel availability. In the reciprocal transplant experiment, edaphic differentiation was proved for the selected serpentine and non-serpentine AMF isolates. The serpentine isolate developed higher root colonization and it was more efficient in growth promotion of and phosphorus uptake by the serpentine plants. Edaphic differentiation of *K. arvensis* populations was found under serpentine conditions in terms of plant growth and element uptake. No differences in calcium nutrition were recorded, while a tolerance to accumulation of magnesium in shoot tissues seemed to be one of the essential adaptive traits of serpentine *K. arvensis* plants.