ID 216 - Plants linked by a common arbuscular mycorrhizal fungal hyphal network: zinc transfer and plant and fungal gene expression

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Introduction. Mineral nutrient redistribution within and among plants is key to an efficient use of fertilizers. To test whether arbuscular mycorrhizas can contribute to zinc (Zn) redistribution between plants, a foliar Zn application experiment was set up with plants connected by a hyphal network.

Methods. The plants were *Medicago truncatula* wild type J5 and arbuscular mycorrhizal-defective mutant TRV25, all grown in the same bi-compartmented autotrophic *in vitro* system with *Rhizophagus irregularis* strain MUCL41833 as connecting fungus. Zinc was applied as droplets to the leaves of the donor plant at 0.1 mg per plant of approximately 0.1 g DW.

Results and discussion. Zinc application increased the leaf and root Zn concentrations in the donor and root Zn concentration in the J5 receiver plant but not in the TRV25 plant. The observed redistribution of Zn was accompanied by an upregulation of the plant nicotianamine synthase gene in the roots of the mycorrhized receiver plant J5. The expression of two fungal Zn transporter genes in the intraradical mycelia of the mycorrhizal donor and receiver plants changed as well in response to Zn application, providing evidence that the fungus sensed and responded to the redistributed Zn. In short, this study demonstrated that Zn applied to leaves differentially regulates plant and fungal gene expression and that it can raise the Zn concentrations in leaves and roots of neighbouring plants connected by an arbuscular mycorrhizal fungus.

Conclusion. We hence suggest that the arbuscular mycorrhizal symbiosis has potential to contribute to a better use of foliar-applied fertilizer in stands of mycorrhized crop plants.

Key words: Arbuscular mycorrhiza, common mycorrhizal hyphal network, differential gene expression, foliar zinc.