Control of bidirectional nutrient transfer in the arbuscular mycorrhizal symbiosis

Xue L., Saridis G., Almario J., Fabianska I., and Bucher M.

Botanical Institute, Cologne Biocenter, Cluster of Excellence on Plant Sciences (CEPLAS), University of Cologne, 50674 Cologne, Germany

The mutualistic arbuscular mycorrhizal (AM) symbiosis depends on reciprocal exchange of phosphorus, driven by proton-coupled phosphate uptake in mycorrhizal host cells, and carbon supplied to AM fungi, propelled by host-dependent sugar and lipid biosynthesis. The molecular mechanism and *cis*-regulatory modules underlying this bi-directional exchange in the AM symbiosis are currently under intense investigation in several research groups. We have screened a set of 43 mycorrhiza-regulated transcription factors for binding the CTTC *cis*-regulatory motif which occurs in many mycorrhiza-specific host genes. AP2 family transcription factor CTTC MOTIF-BINDING TRANSCRIPTION FACTOR1 (CBX1), a WRINKLED1 (WRI1) protein, activates mycorrhiza-inducible phosphate transporter 4 (*LjPT4*) and H^+-ATPase (*LjHA1*), implicated in energizing nutrient uptake at the symbiotic interface in *Lotus japonicus*. Furthermore, we could show that CBX1 regulates expression of lipid metabolic genes including glycerol-3-phosphate acyltransferase RAM2 implicated in acylglycerol biosynthesis. Our findings define the role of CBX1 as a central regulator in AM symbiosis, and support a model underlying bidirectional exchange of nutrients and metabolites, a fundamental trait in the mutualistic AM symbiosis.

Furthermore, to understand the effect of AM symbiosis on the root-associated microbiota, the fungal communities associated with the roots of ten *L. japonicus* mutants impaired at different stages of AM formation were explored. The implications of arbuscule malformation on tripartite interactions between the host plant, its root microbiota and AM fungi will be discussed.

References

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