Essential factors for arbuscular mycorrhizal symbiosis: lessons from maize and rice

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The mutually beneficial arbuscular mycorrhizal (AM) symbiosis is the most widespread plant-fungal interaction between roots of terrestrial plants and fungi of the Glomeromycota. The association receives increasing scientific attention because of the nutritional benefit it confers to host plants, which is particularly pronounced for phosphate. Mutants defective in AM symbiosis resulted from a forward genetics screen in maize (Paszkowski et al. 2006, Plant J. 47: 165-173). The nope1 (no perception 1) mutant displayed loss of susceptibility, indicative of pre-symbiotic function to be affected. The mutation segregated as a monogenic recessive trait and was mapped to the peri-centromeric region of maize chromosome 10. Gene cloning efforts employed a synteny-based approach in rice and identified a candidate gene, whose disruption reproduced the maize nope1 phenotype, thereby suggesting the successful cloning of NOPE1. Insertion alleles in the corresponding maize gene have been identified via Ds tagging and are currently examined for their impact on symbiotic properties. The gene is predicted to encode a protein of unknown function but assumed to be involved in transport processes across membranes as it groups with the major facilitator superfamily. Recently, we have made the exiting observation that wild-type root exudates complemented the mutant phenotype "in trans". It can therefore be hypothesized that NOPE1 participates in an efflux activity across the plasma membrane of root cells.

Keywords: Rice, Maize, Glomus, AM mutant, rhizosphere, signaling