LASER DISSECTED CELLS REVEAL A CELL SPECIFIC DISTRIBUTION OF NUTRIENT TRANSPORTERS IN MYCORRHIZAL ROOTS

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Arbuscular mycorrhizal fungi (AMF) are an essential feature of the biology and ecology of most terrestrial plants and, as biofertilizers, AM fungi are an emerging issue in many projects focused on more sustainable, low-input agriculture practices. The identification of the events that lead to the formation of an AM, including the mechanisms involved in nutrient transfer, will be a challenging objective for a better exploitation of AMs in agricultural programs. The success of AM fungi in time and space is mainly linked to the nutritional benefits they confer to their plant hosts: they take up inorganic phosphate (Pi) and other macronutrients as well as microelements and water from the soil, and deliver them to the plant. The fungus, in turn, receives photosynthetic carbohydrates. Recent global transcriptomic studies of mycorrhizal roots revealed extensive changes in gene expression profiles. However, root colonization by AMF occurs by sequential steps only involving several cell types, with a specific functional role. Over the last few years, laser microdissection (LMD) has been used to study cell-specificity in arbuscular mycorrhizae and particular attention has been paid to the cortical cells containing the main feature of the symbiosis: the arbuscules. The LMD approach led to novel insights into the distribution of phosphate transporter (PT) transcripts during the AM interaction between tomato and *Glomus mosseae*. Transcripts of five tomato PT genes (*LePTs*) were, in fact, simultaneously detected in arbuscule-containing cells, unlike the neighbouring non-colonized cells. The contemporaneous presence of five plant PT mRNAs in the arbuscule-containing cells strongly suggests that the symbiosis enhances plant Pi uptake capabilities by recruiting additional PTs in this cell population. On the fungal side, the presence of *GmosPT* transcripts in the arbusculated cells suggest that the efflux of phosphate probably occurs in competition with its uptake and the fungus might exert control over the amount of phosphate delivered to the plant.

Recently, the gene expression of *Lotus japonicus* arbuscule-containing cells isolated by LMD was used to confirm array experiments. As in the previous work, three types of homogeneous cell populations were microdissected: cortical cells from non-mycorrhizal roots (C); non-colonized cortical cells from mycorrhizal roots (MNM) and arbuscule-containing cells (ARB). Taken together, the results provide novel information on the location of the genes that are involved in nutrient transport. Among the last, a plant ammonium transporter (AMT) that is involved in N-uptake during mycorrhiza symbiosis has been identified and transcripts are mainly localized to arbusculated cells. The transporter is exclusive of mycorrhizal roots, since it is not expressed during nodule symbiosis, and may represent a novel functional trait of AMs.