

MtCOPT1 mediates copper transport to *Medicago truncatula* nodules

Senovilla M¹, Castro-Rodríguez R¹, Imperial J^{1,2}, González-Guerrero M¹.

¹Universidad Politécnica de Madrid. Centro de Biotecnología y Genómica de Plantas, Pozuelo de Alarcón, 28223 Madrid. Spain. ²Consejo Superior de Investigaciones Científicas. Madrid. Spain.

Copper is an essential oligonutrient. Its redox properties allow it to be a suitable cofactor for many proteins, such as cytochromes or superoxide dismutases. Copper is key for Symbiotic Nitrogen Fixation (SNF); For instance, bacteroids contain copper-dependent cytochrome oxidases that provide energy in the microaerobic environment within the nodule. Once copper is in the plant, it is delivered by the vasculature to the apoplast of zone II. From there, a plasma membrane transporter introduces this nutrient into the cell for copper-protein assembly. COPT family transporters mediate high-affinity copper transport towards the cytosol. Therefore, they are good candidates to introduce copper in nodule cells. From the 8 *COPT* family genes present in *M. truncatula* genome, *MtCOPT1* is the only one induced specifically in nodule. *MtCOPT1* can restore *Saccharomyces cerevisiae* $\Delta ctr1$ capacity to uptake copper. Immunolocalization and GUS fusion studies localize *MtCOPT1* in the nodule. Moreover, a Tnt-1-derived knockdown mutant line for *MtCOPT1* shows decreased nitrogenase activity when compared with the wild-type line. This activity is, at least, partially rescued when a wild-type copy of *MtCOPT1* gene is reintroduced. Taken together, all this data suggest an important role of *MtCOPT1* copper-mediated transport for SNF.

Acknowledgments

This work was supported by ERC Starting Grant (ERC-2013-StG-335284) and MINECO Grant (AGL-2012-32974) to M.G-G.