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Response of nitrogen nutrition to challenging environment in *Arabidopsis*

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Because of the dramatic effects of nitrogen on growth and development, plants have evolved to adapt to a challenging environment. At the level of root nitrate uptake it results in a highly integrated process, which is determined by nitrate availability, the nitrogen demand of the whole plant and the carbon produced by photosynthesis. This last regulation enables plants to adjust nitrogen acquisition by roots and carbon acquisition by shoots, which is necessary for the incorporation of inorganic nitrogen into amino acids and proteins. The results we obtained revealed that the control of root nitrate uptake by carbon signalling depends on a signal coming from the Oxidative Pentose Phosphate Pathway (OPPP). Interestingly, OPPP is a major source of NADPH and is critical to maintain redox balance under stress situation. This led to the hypothesis of an OPPP-related redox regulation of root nitrate uptake. This hypothesis is supported by recent data showing that root nitrate transporters in *Arabidopsis* are also regulated by the redox status of the plant. Furthermore, preliminary data indicate that the signalling mechanism is linked to the first step of the OPPP, coded by *G6PDH* and involved in the production of NADPH. Finally, it seems that oxidative stress could be a more general hidden player in the regulation of nitrogen nutrition. Indeed, recent results suggest that at least part of the regulation of root nitrate transporters by N signaling is also link to the redox status of the plant. In this context, further developments, in collaboration with the group of Yves Gibon in Bordeaux and Rodrigo Gutierrez in Chile, will concern the implication of such signalling pathways for plants adaptation to extreme environment in the Atacama desert.