***The NRT2.3 Nitrate Transporter Plays a Positive Role in Nodule Function Medicago truncatula***

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Nitrate (NO3-) is the major inorganic form of nitrogen absorbed by plants and a key external environmental factor in regulating root nodule symbiosis and nitrogen fixation. As N2-fixation is relatively energy intensive, low nitrogen levels promote nodulation while high nitrogen inhibits nodulation and nitrogen fixation in legumes. Here, we show that *Medicago truncatula* *NRT2.3* encodes a plasma membrane localized high affinity nitrate transporter plays an essential role in balancing nitrate transport in roots and in nodules. Loss of *NRT2.3* in non-symbiotic conditionscaused nitrate accumulation in roots while decreasing shoot nitrate content. Under symbiotic conditions, *nrt2.3* mutants formed fewer nodules, and the nodules that formed had decreased acetylene reduction activity. Moreover, *nrt2.3* nodules were greenish in color, showed symbiosome degradation, and had higher expression of the senescence marker gene *Cysteine Protease 6*. Finally, both high nitrate (5 mM KNO3) and low nitrite (0.5 mM KNO2) treatments promoted the formation of green nodules in *nrt2.3,* which was associated with higher levels of nitrate and nitrite in the mutants. From these findings we conclude that *MtNRT2.3* mediated nitrate transport in nodules is important for optimal nitrogen fixation.