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Overexpression of an Arabidopsis magnesium transport gene, AtMGT1, in *Nicotiana benthamiana* confers Al tolerance.

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Abstract

Aluminium (Al) toxicity is the most important limiting factor for crop production in acid soil environments worldwide. In some plant species, application of magnesium (Mg(2+)) can alleviate Al toxicity. However, it remains unknown whether overexpression of magnesium transport proteins can improve Al tolerance. Here, the role of AtMGT1, a member of the Arabidopsis magnesium transport family involved in Mg(2+) transport, played in Al tolerance in higher plants was investigated. Expression of 35S::AtMGT1 led to various phenotypic alterations in *Nicotiana benthamiana* plants. Transgenic plants harbouring 35S::AtMGT1 exhibited tolerance to Mg(2+) deficiency. Element assay showed that the contents of Mg, Mn, and Fe in 35S::AtMGT1 plants increased compared with wild-type plants. Root growth experiment revealed that 100 microM AlCl(3) caused a reduction in root elongation by 47% in transgenic lines, whereas root growth in wild-type plants was inhibited completely. Upon Al treatment, representative transgenic lines also showed a much lower callose deposition, an indicator of increased Al tolerance, than wild-type plants. Taken together, the results have demonstrated that overexpression of ATMGT1 encoding a magnesium transport protein can improve tolerance to Al in higher plants.

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