The family of ammonium transporters (AMT) in Sorghum bicolor : two AMT members are induced locally, but not systemically in roots colonized by arbuscular mycorrhizal fungi

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Arbuscular mycorrhizal (AM) fungi contribute to plant nitrogen (N) acquisition. Recent studies demonstrated the transport of N in the form of ammonium during AM symbiosis. Here, we hypothesize that induction of specific ammonium transporter (AMT) genes in Sorghum bicolor during AM colonization might play a key role in the functionality of the symbiosis. For the first time, combining a split-root experiment and microdissection technology, we were able to assess the precise expression pattern of two AM-inducible AMTs, SbAMT3;1 and SbAMT4. Immunolocalization was used to localize the protein of SbAMT3;1. The expression of SbAMT3;1 and SbAMT4 was greatly induced locally in root cells containing arbuscules and in adjacent cells. However, a split-root experiment revealed that this induction was not systemic. By contrast, a strictly AM-induced phosphate transporter (SbPt11) was expressed systemically in the split-root experiment. However, a gradient of expression was apparent. Immunolocalization analyses demonstrated that SbAMT3;1 was present only in cells containing developing arbuscules. Our results show that the SbAMT3;1 and SbAMT4 genes are expressed in root cortical cells, which makes them ready to accommodate arbuscules, a process of considerable importance in view of the short life span of arbuscules. Additionally, SbAMT3;1 might play an important role in N transfer during AM symbiosis.

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