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ACC deaminase genes are conserved among Mesorhizobium species able to nodulate the same host plant

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Source: FEMS MICROBIOLOGY LETTERS **Volume:** 336 **Issue:** 1
Pages: 26-37 **DOI:** 10.1111/j.1574-6968.2012.02648.x
Published: NOV 2012

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Abstract: Rhizobia strains expressing the enzyme 1-aminocyclopropane-1-carboxylate (ACC) deaminase have been reported to display an augmented symbiotic performance as a consequence of lowering the plant ethylene levels that inhibit the nodulation process. Genes encoding ACC deaminase (*acdS*) have been studied in *Rhizobium* spp.; however, not much is known about the presence of *acdS* genes in *Mesorhizobium* spp. The aim of this study was to assess the prevalence and phylogeny of *acdS* genes in *Mesorhizobium* strains including a collection of chickpea-nodulating mesorhizobia from Portugal. ACC deaminase genes were detected in 10 of 12 mesorhizobia type strains as well as in 18 of 18 chickpea *Mesorhizobium* isolates studied in this work. No ACC deaminase activity was detected in any *Mesorhizobium* strain tested under free-living conditions. Despite the lack of ACC deaminase activity, it was possible to demonstrate that in *Mesorhizobium ciceri* UPM-Ca7T, the *acdS* gene is transcribed under symbiotic conditions. Phylogenetic analysis indicates that strains belonging to different species of *Mesorhizobium*, but nodulating the same host plant, have similar *acdS* genes, suggesting that *acdS* genes are horizontally acquired by transfer of the symbiosis island. This data, together with analysis of the symbiosis islands from completely sequenced *Mesorhizobium* genomes, suggest the presence of the *acdS* gene in a *Mesorhizobium* common ancestor that possessed this gene in a unique symbiosis island.

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E-mail Address: ismo@uevora.pt**Publisher:** WILEY-BLACKWELL, 111 RIVER ST, HOBOKEN 07030-5774, NJ USA**Web of Science Categories:** Microbiology**Research Areas:** Microbiology**IDS Number:** 019IO**ISSN:** 0378-1097

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