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

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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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