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New insights into indole-3-acetic acid metabolism in Azospirillum brasilense.

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Abstract

AIMS: The aim of this research was to analyze the global IAA metabolism in three commercially used strains of A. brasilense.

METHODS AND RESULTS: A. brasilense Sp245, Az39 and Cd, containing a plasmid with the ipdC-gusA fusion (pFAJ64), were cultured in minimal medium MMAB with or without 10 $mg.l^{-1}$ of L-trp till exponential or stationary growth phase. The cultures were then split into 10 ml tubes and individually treated with 10 $mg.ml^{-1}$ IAA, IBA or NAA (auxin catabolism and homeostasis); IAPhe, IALeu, IAA-ala, IAA-glucose (IAA conjugate hydrolysis); or L-lys, L-leu, L-ileu, L-phe, L-ala, L-val, L-arg, L-glu, L-his, L-met, L-asp, L-cys, L-ser, L-pro, L-thr and L-trp (regulation of IAA biosynthesis and IAA conjugation). Bacterial growth, IAA production and ipdC expression were evaluated. None of the A. brasilense strains were able to hydrolyze IAA conjugates, catabolize auxins, or conjugate IAA with amino acids or glucose. L-amino acids L-met, L-val, L-cys and L-ser inhibited bacterial growth and decreased IAA biosynthesis. The expression of ipdC and IAA biosynthesis but not bacterial growth were affected by L-leu, L-phe, L-ala, L-ile, L-pro. L-arg, L-glu, L-his, L-lys, L-asp and L-thr did not affect any of the measured parameters.

CONCLUSIONS: In this paper we confirmed that A. brasilense produces IAA only in presence of L-trp, is not able to degrade auxins, conjugate IAA with sugars and/or L-amino acids, or hydrolyze such conjugates to release free IAA. Finally, we found that bacterial growth and/or IAA biosynthesis were inhibited by the presence of several L-amino acids probably by diversion of the cellular metabolism.

SIGNIFICANCE AND IMPACT OF STUDY: We propose a renewed model to explain IAA metabolism in A. brasilense, one of the most studied phytostimulatory bacteria. This article is protected by copyright. All rights reserved.

KEYWORDS: Azospirillum brasilense ; L-amino acids; auxins; catabolism; conjugation; homeostasis; hydrolysis; indole-3-acetic acid; metabolism

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