

Identification and Characterization of Integrative and Conjugative Elements (ICEs) in the genomes of new plant growth-promoting bacteria

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Plant Growth-Promoting Bacteria (PGPBs) are microorganisms widely distributed in various environments and are capable of stimulating plant development through numerous mechanisms. Within these bacteria, Integrative and Conjugative Elements (ICEs) can be found, which are chromosomal mobile elements capable of transferring genes of adaptive value between organisms. Nowadays, new genera of PGPBs, such as *Azoarcus*, *Pantoea*, *Kosakonia*, *Novosphingobium*, and *Pandoraea*, are being investigated for their ability to establish these beneficial relationships. This study aimed to identify and analyze ICEs present in the genomes of these genera, as well as investigate accessory genes within these elements with putative functions related to plant growth promotion processes. To achieve this purpose, complete genomes of *Azoarcus* (6), *Pantoea* (77), *Kosakonia* (22), *Novosphingobium* (18), and *Pandoraea* (27) were retrieved from the National Center for Biotechnology Information (NCBI) database, deriving from the rhizosphere, soil, and roots. After this step, the ICEfinder software was used to identify regions with a *Type IV secretion system* (T4SS). Subsequently, conserved sequences were identified to determine the origin of transfer (*OriT*) in the genomes using OriTfinder. Then, antiSMASH was used to identify secondary metabolites produced by these bacteria, while the Plant-associated Bacteria web resource (PLaBAs) in PGPT-Pred blastp+hmmer (strict) mode was used to find genes related to plant growth promotion within the potential ICEs. Each of the investigated genera, *Azoarcus* (3), *Pantoea* (28), *Kosakonia* (4), *Novosphingobium* (4), and *Pandoraea* (2), showed positive results regarding the presence of ICEs, with variable sizes ranging from 28,348 to 574,074 base pairs. After selection, genes of significant relevance in promoting plant resistance to biotic and abiotic factors, such as osmotic and thermal stress, were identified. Furthermore, the potential ability of all genera to solubilize phosphate, fix nitrogen, produce siderophores and antimicrobial compounds, and promote resistance to heavy metals was observed. These findings highlight the studied genera as promising plant growth-promoting agents and their potential applications in transferring these characteristics to other soil bacteria. However, *in vivo* experiments with bacteria containing these ICEs are necessary for a better understanding of their role in interactions between bacteria and plants.

Key words: Plant Growth-Promoting Bacteria; Integrative and Conjugative Elements; Bioinformatics

Identificação e Caracterização de Elementos Integrativos e Conjugativos (ICEs) nos genomas de novas bactérias promotoras de crescimento em planta

As Bactérias Promotoras de Crescimento de Plantas (PGPBs) são microrganismos que estimulam o crescimento de plantas, podendo conter Elementos Integrativos e Conjugativos (ICEs) que transferem genes adaptativos. Este estudo visa identificar ICEs em novos gêneros de PGPBs e sua relação com o crescimento vegetal. Foram identificados ICEs em todos os gêneros estudados. Essas bactérias apresentaram uma promissora capacidade de promover crescimento vegetal e resistência a fatores estressantes. No entanto, experimentos *in vivo* das bactérias contendo essas ICEs são necessários para entender as interações desses elementos na relação entre bactérias e plantas.

Palavras-chave: Bactérias Promotoras de Crescimento de Plantas; Elementos Integrativos e Conjugativos; Bioinformática