

# Complete Genome of the Plant Growth-Promoting Rhizobacterium *Pseudomonas putida* BIRD-1<sup>∇</sup>

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**We report the complete sequence of the 5.7-Mbp genome of *Pseudomonas putida* BIRD-1, a metabolically versatile plant growth-promoting rhizobacterium that is highly tolerant to desiccation and capable of solubilizing inorganic phosphate and iron and of synthesizing phytohormones that stimulate seed germination and plant growth.**

Bacteria that efficiently colonize the rhizosphere and stimulate plant growth through direct or indirect mechanisms are referred to as plant growth-promoting rhizobacteria (PGPR). Plant growth promotion can be mediated by the synthesis of phytohormones, enhanced uptake of mineral nutrients, antagonizing of soilborne pathogens, induction of systemic resistance, etc. (1). The use of PGPR as inoculants for biofertilization, phytostimulation, and biocontrol avoids the use of chemical fertilizers and pesticides.

*Pseudomonas putida* BIRD-1 is a soil bacterium that is efficient as a PGPR agent through the mobilization of nutrients and stimulation of secondary root proliferation. The complete genome sequence of BIRD-1 was obtained using 454 pyrosequencing technology. The sequences of 499,016 reads were assembled into 106 contigs to give 20× coverage. Fifty-two contigs were longer than 3,000 bp. The complete genome of *P. putida* BIRD-1 is made up of a 61.74%-GC circular chromosome of 5,731,541 bp with no plasmid. The genome size is similar to that of *P. putida* W619 (5,774,330 Mb) (4) and smaller than those of *P. putida* KT2440 (6,181,860 Mb) (2), *P. putida* F1 (5,959,964 Mb), and *P. putida* GB-1 (6,078,430 Mb).

The genome of BIRD-1 encodes 5,124 proteins, 64 tRNAs, eight 5S rRNAs, seven 16S rRNAs, and 23S rRNA. All essentially conditional genes identified in KT2440 (3) are present in the genome of BIRD-1, and functions were assigned to almost 60% of the total coding genes. The genome of *P. putida*

BIRD-1 encodes a number of root colonization determinants (4) and a number of elements that favor plant growth. The ability of *P. putida* BIRD-1 to solubilize inorganic phosphate is related to the production of gluconic acid, whereas the ability to solubilize iron is related to the synthesis of pyoverdines. All genes required for these functions have been identified; BIRD-1 produces the indole-3-acetic acid (IAA) plant hormone, a trait associated with stimulation of root initiation and elongation. Two putative tryptophan-dependent IAA biosynthetic pathways have been identified in this strain. The genome of BIRD-1 also contains genes encoding proteins for the synthesis of salicylate, another compound that is relevant in plant responses.

**Nucleotide sequence accession number.** The complete genome sequence of *P. putida* BIRD-1 is available in GenBank under accession number CP002290.

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