

## Streszczenie i słowa kluczowe w języku angielskim

*In vitro* and *in planta* analyses of the potential of twenty-six plant growth-promoting endophytic bacterial strains isolated from root nodules of *Fabaceae* plants have been carried out. The comparative analysis of the 16S rRNA gene and the multilocus sequence analysis (MLSA) of four housekeeping genes were conducted to determine the taxonomic affiliation of the tested isolates. The tolerance to different pH values and the abilities to grow at various temperatures and different NaCl, As, Cu, and Al concentrations were assessed. The abilities of the bacteria towards motility, production of *quorum sensing* signaling molecules, biofilm formation, ACC degradation, and nitrogen fixation were assessed. The evaluation of the bacterial abilities to produce IAA, indole, metallophores, and hydrogen cyanide were carried out. Their capabilities of solubilization of triphosphates, decomposition of cellulose and proteins, and utilization of diesel oil hydrocarbons were tested. The potential of the bacteria to induce the seeds germination process and to inhibit bacterial and fungal phytopathogens growth was tested. The strains selected based on *in vitro* tests results were tested in pot experiments to assess the influence of single bacterial strains (or in co-inoculation with rhizobial bacteria) on the growth properties of inoculated plants cultivated in peat substrate or peat substrate contaminated with copper or arsenic ions or diesel fuel.

Based on the genetic analyses, the bacteria were assigned to the genera *Methylobacterium*, *Methylorubrum* and *Micromonospora*. The tested strains of endophytic bacteria showed different abilities to implement the plant growth mechanisms studied *in vitro*; therefore, the strains exhibited different potential to promote plant growth *in planta*. Strains *Methylobacterium* sp. Red Mix I, *Micromonospora* sp. 5056, *Micromonospora* sp. 48, and *Micromonospora* sp. N5 were effective in promoting the growth of the plant hosts. Thus, we postulate that these selected bacteria have the potential to be used in agriculture or phytoremediation processes as biological agents.

**key words:** endophytic bacteria; plant growth promoting bacteria; plant growth promoting mechanisms; *Methylobacterium*; *Methylorubrum*; *Micromonospora*

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