

# Plant growth promoting properties of Zn/Cd tolerant rhizobacteria: studied under Zn and/or Cd stress

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## Abstract

Microbial activities in rhizosphere soils can enhance the effectiveness of phytoremediation processes. Indigenous microorganisms are suitable as they adapt to survival requirements in the polluted soil, especially the tolerance and responses of bacteria in the metabolite aspects. This research investigated the characteristics of Zn/Cd tolerant bacteria, which were isolated from rhizosphere of *Gynura pseudochina* (L.) DC., a Zn/Cd hyperaccumulative plant. The six isolates are *Brevibacterium* sp. PDMZn2008, *Serratia* sp. PDMCd0501, *Serratia* sp. PDMCd2007, *Providencia* sp. PDMCd2008, *Providencia* sp. PDMZnCd1502, and *Pseudomonas* sp. ZnCd2003. Their plant growth promoting properties were studied under Zn and/or Cd stress. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) methods were carried out to evaluate the lowest concentrations of Zn and/or Cd that inhibited and killed the bacterium. The effects of Zn and/or Cd stress on growth and abilities for indole-3-acetic acid (IAA) production, N<sub>2</sub>-fixation and phosphate solubilisation were investigated in media under absence and presence of Zn plus Cd (20+20 mg l<sup>-1</sup>). Growth of the six isolates tended to decrease under the Zn and/or Cd stress, however, their plant growth properties remained under the Zn plus Cd. The biodiversity of Zn/Cd tolerant bacteria and their properties could be served as biofertilizer candidates for microbe assisted phytoremediation in Zn/Cd contaminated area, especially, *Pseudomonas* sp. ZnCd2003.

**Keywords:** Plant growth promoting, biofertilizer, rhizobacteria, zinc, cadmium