



Consortium of plant growth-promoting bacteria improves spinach (*Spinacea oleracea* L.) growth under heavy metal stress conditions

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ABSTRACT

BACKGROUND

Heavy metal contamination results in oxidative stress to plants and leads to decreasing in plant growth and development. Such plants could not be efficiently used in phytoremediation studies and their potential may be significantly reduced. In many cases bioaugmentation with plant growth-promoting bacteria is used as a strategy to alleviate the stress conditions.

RESULTS

Isolates were found to possess 1-aminocyclopropane-1-carboxylate-deaminase, to produce indole-3-acetic acidsiderophores and to solubilize phosphates, while the identification revealed that the isolates belonged to the genera *Pseudomonas* and *Bacillus*. Out of the seventeen isolates, ten were found to possess 1-aminocyclopropane-1-carboxylat -desaminase activity producing 1-3.2 $\mu\text{mol.mg}^{-1}.\text{h}^{-1}$ of α -ketobutyrate and siderophores of chatechol and hydroxamate type. Higher quantity of indole-3-acetic acid was observed in case of the isolate SGPI41 ($65 \mu\text{g.ml}^{-1}$). In addition to that, the inoculation of consortiums of isolates led to decreasing of accumulation of Cd, Pb and Zn in the whole plant, but at the same time increased the plant biomass with up to 100 % compared to the uninoculated control.

CONCLUSIONS

The use of beneficial bacteria possessing plant growth-promoting traits is a very useful approach to alleviating heavy metal stress to plants and can be successfully applied in phytoremediation strategies.

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