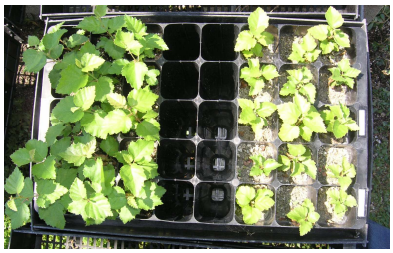
Plant growth bacteria as promoters of *Betula pubescens* establishment in anthropogenic sediments

Albina R. Franco, Nadine R. Sousa, Miguel A. Ramos, Natacha Ogando, Paula M.L. Castro
CBQF/Escola Superior de Biotecnologia
Universidade Católica Portuguesa
Porto, Portugal

➢ Introduction

Over the last decades, industrial sediment deposition has increased, contaminating not only soil and their surrounding areas but also other natural resources. This poses a threat to human and animal health, and adversely affects microbial processes. Also, the potential use of such contaminated sites for agriculture and forestry practices is jeopardised and their remediation is critical and expensive. The utilization of biotechnological tools, such as plant growth promoting bacteria (PGPB), could help remediation of industrial contaminated soil as they can be used as plant facilitators for land recovery. These bacteria have been found to be beneficial for plant development through the release of metabolites which directly stimulate growth.
The aim of this study was to assess the potential of PGPB to enhance the growth of *Betula pubescens* in high pH antropogenic sediments and forest soil and compare the bacterial performance in both substrates.



Example of the experimental design

➢ Methodology

-Seedlings of *Betula pubescens* were inoculated with *Bacillus pumilus* (B1), *Mesorhizobium* sp. (B2) and *Streptomyces* sp. (B3). A control treatment with no bacterial inoculum was also performed;

- The development after six months-old seedlings growth was assessed and the bacterial community was analysed by PCR-DGGE, with the amplification of the 16S rDNA region, using 27f and 1492r, and nested-pcr using 357f-gc and 518r primers;

-DGGE was performed 1x TAE buffer using a denaturing gradient ranging from 20 to 60% [100% denaturant solution contained 7 M urea and 40% (v/v) formamide]. The gel was run for 16 h at 60 °C at 70 V in 1 × TAE buffer.

➢ Results and Discussion

-The inoculated bacteria persisted on inoculated soil samples after six months;

-B2 was detected only in the Industrial sediment and B3 in Forest soil. Only B1 was identified in both soil type;

-Differences arose between inoculated and uninoculated soil, suggesting that PGPB may significantly influence the rhizosphere bacterial community established over a period of time.

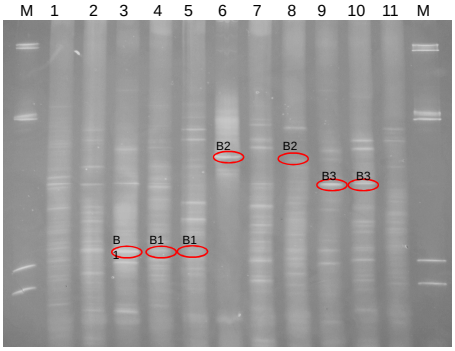
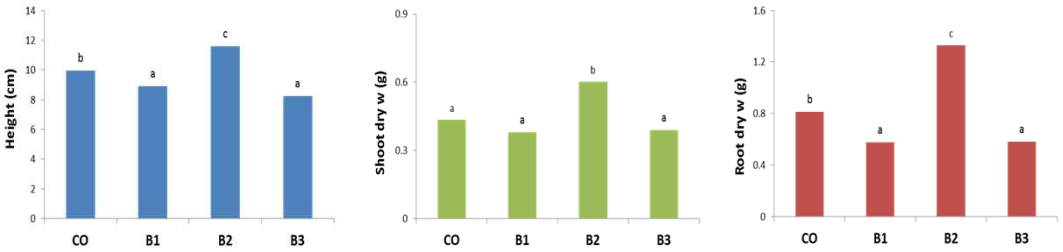


Figure 1: DGGE band profile of v3 fragments of 16S rDNA of Betula growth in forest soil (F) and industrial sediment (I). Legend: M – Marker; 1 – Betula growth in Forest soil; 2- Betula growth in Industrial sediment; 3- B1; 4- Betula inoculated with B1 in Forest soil; 5 - Betula inoculated with B1 in Industrial sediment; 6- B2; 7- Betula inoculated with B2 in Forest soil; 8 - Betula inoculated with B2 in Industrial sediment; 9- B3; 10- Betula inoculated with B3 in Forest soil; 5 - Betula inoculated with B3 in Industrial sediment.



-In forest soil B2 and B3 significantly increased seedling growth in all growth parameters studied;

-In industrial sediment, only B2 positively affected seedling growth and performance;

-Overall B1 had no significant effect in the tested soils.

Figure 2: Shoot height, shoot dry weight and root dry weight of *Betula pubescens* seedlings inoculated with *Bacillus pumilus* (B1), *Mesorhizobium* sp. (B2) and *Streptomyces* sp. (B3) and non-inoculated control (CO), growing in high pH antropogenic sediments. Columns marked with different letters differed significantly according to Duncan's Multiple Range test at $P < 0.05$.

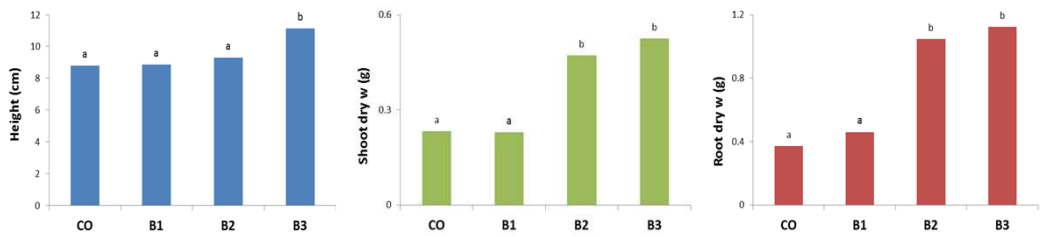


Figure 3: Shoot height, shoot dry weight and root dry weight of *Betula pubescens* seedlings inoculated with *Bacillus pumilus* (B1), *Mesorhizobium* sp. (B2) and *Streptomyces* sp. (B3) and non-inoculated control (CO), growing in forest soil. Columns marked with different letters differed significantly according to Duncan's Multiple Range test at $P < 0.05$.

➢ Conclusions

-Selected bacterial isolates can significantly **enhance** the **growth** of *Betula pubescens;*

- Further studies are needed to understand plant-bacteria specificity to help the development of more resistant and healthier outplanted seedlings, under stress conditions.

Acknowledgements

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