

Ana S.S. Sousa^{1*}, Sofia I.A. Pereira^{1**}, Helena Moreira^{1***}, Flávia Darú¹, Joaquim Cunha¹, Paula M.L. Castro^{1****}
¹Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Porto, Portugal ; *assousa@ucp.pt; **sapereira@ucp.pt; ***hgmoreira@ucp.pt; ****plcastro@ucp.pt;

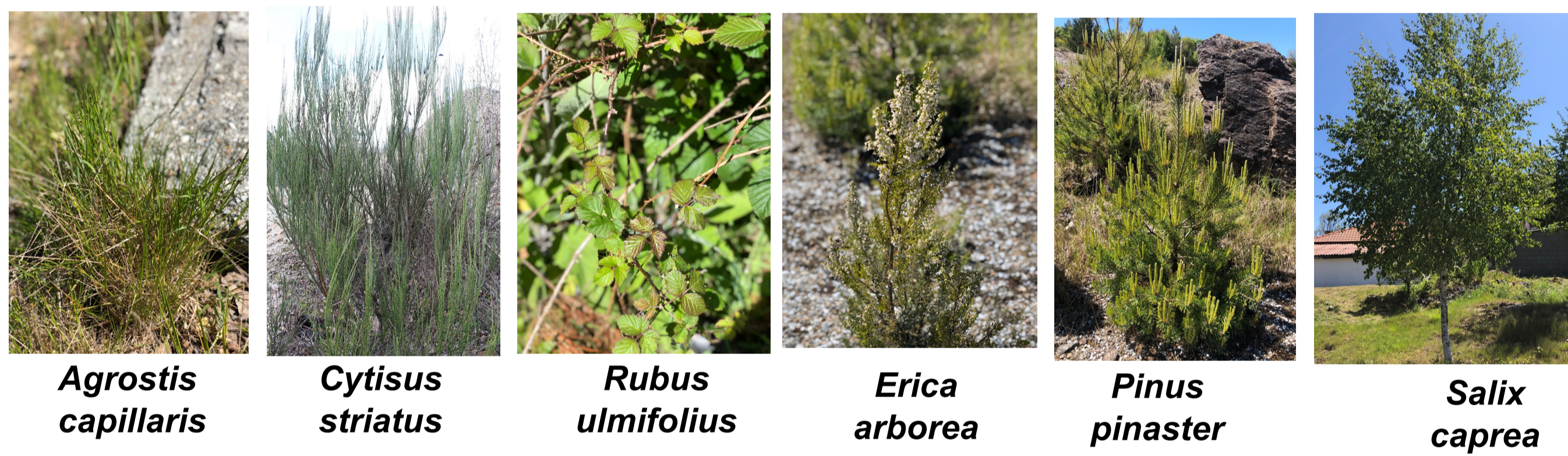
INTRODUCTION

- Soil contamination is a worldwide problem that negatively affects the environment and human health.
- Mining activities are responsible for releasing a high concentration of metal(loid)s (e.g Cu, Cd), into the soil.
- Phytotechnologies** are environmentally friendly tools that use plants and their associated microorganisms to reclaim contaminated areas and decrease pollutant linkages.
- Mining sites host plants adapted to high concentrations of metal(loid)s – metallophytes - that can be used in phytotechnologies.

The present study aimed to **identify metal-tolerant rhizobacteria from the most abundant metallophytes** found in Borralha mine tailings and **evaluate their beneficial effects on plant growth.**

METHODOLOGY

Most abundant metallophytes found in mine tailings



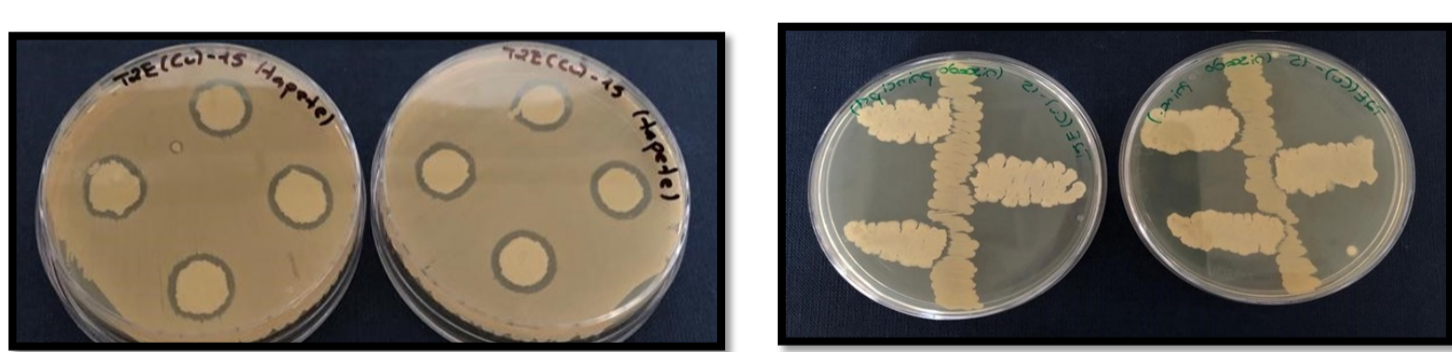
65 bacteria were isolated; 37 were chosen according to Cu, Cd, Zn and Pb tolerance and **identified by 16S rRNA sequencing**



The bacterial strains were characterized for plant growth promoting traits (PGPT's).

- Siderophore production;
- Indoleacetic acid (IAA) production;
- P solubilization;
- Biofilm production;

The strains that better **performed**, were tested for their biocompatibility. However, they showed antagonistic behaviour.



Bacillus velenensis was selected for the pot experiment.

Greenhouse trial- Experimental design



Treatments:
C – mine tailings (without inoculation)
V - mine tailings + 10% vermicompost (V)
V + B – mine tailings +10% V + *Bacillus velenensis* (B) (6.6×10^8 CFU/kg soil)
V + Mix – mine tailings + 10% V + B + mix of AMF spores (0.001g/kg soil)

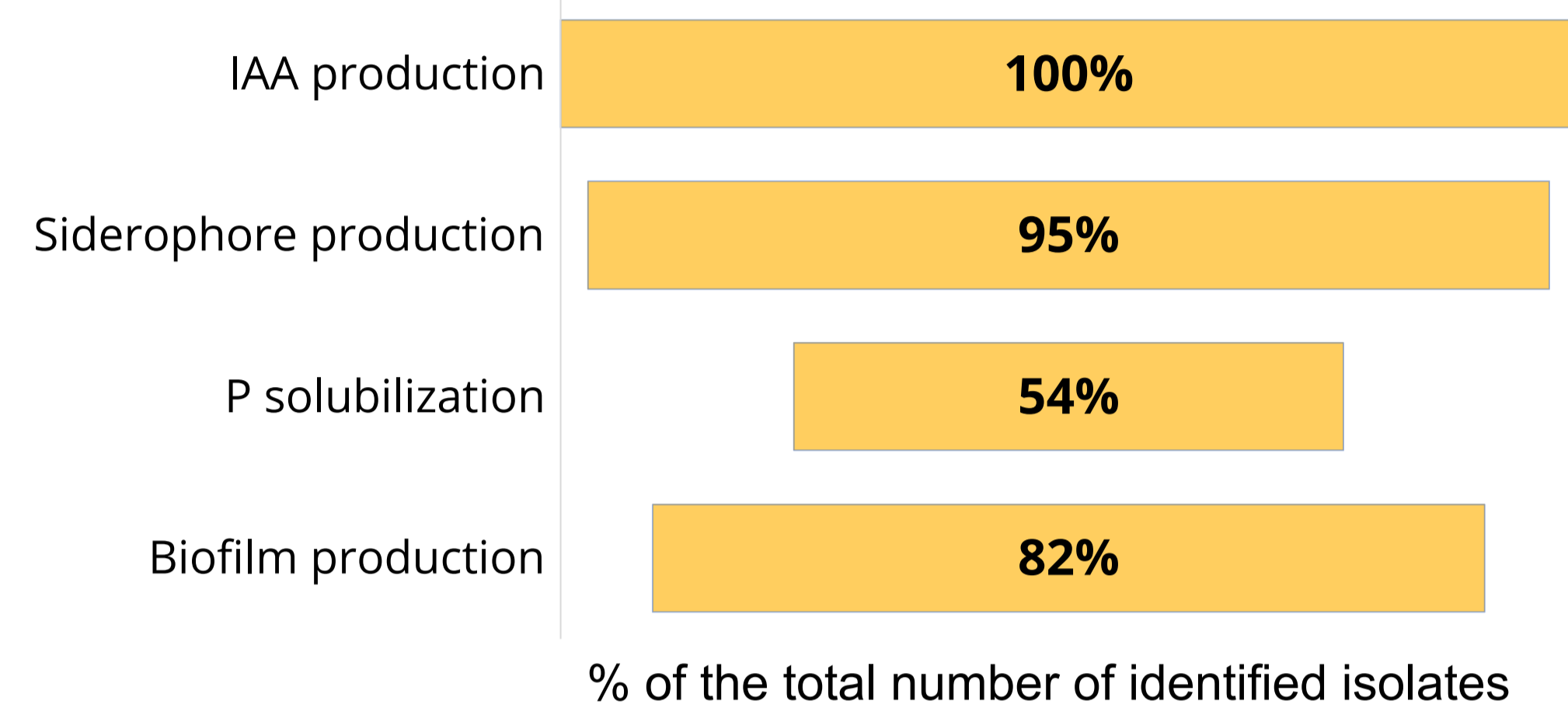
CONCLUSIONS

- ⇒ Several bacterial strains with good plant-growth promoting traits were isolated from the rhizosphere of metallophytes present in Borralhas' mine tailings;
- ⇒ The addition of vermicompost to mine tailings soil increased significantly plant growth and soil microbial activity;
- ⇒ In general, bioaugmentation reinforced the positive effects of vermicompost, both in plant growth and microbial activity;

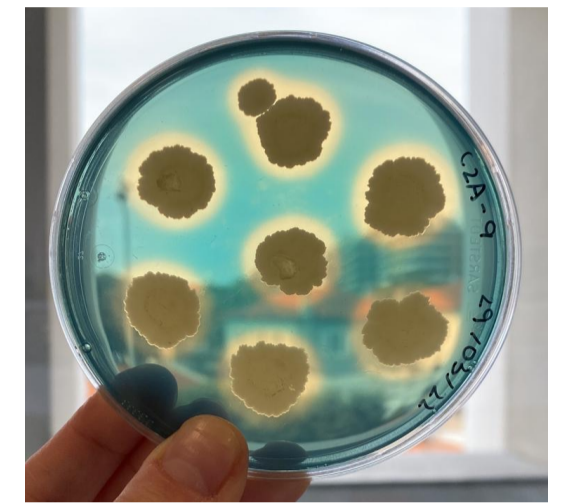
RESULTS

Bacteria identification showed that 80% were Gram-positive, with 45% being Bacilli and the predominant genera were *Priestia sp.*, *Arthrobacter sp.*, *Rhodococcus sp.* and *Burkholderia sp.*

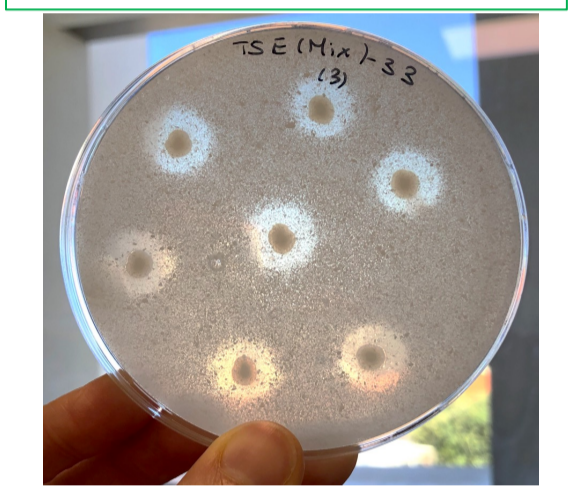
Bacteria PGPT's



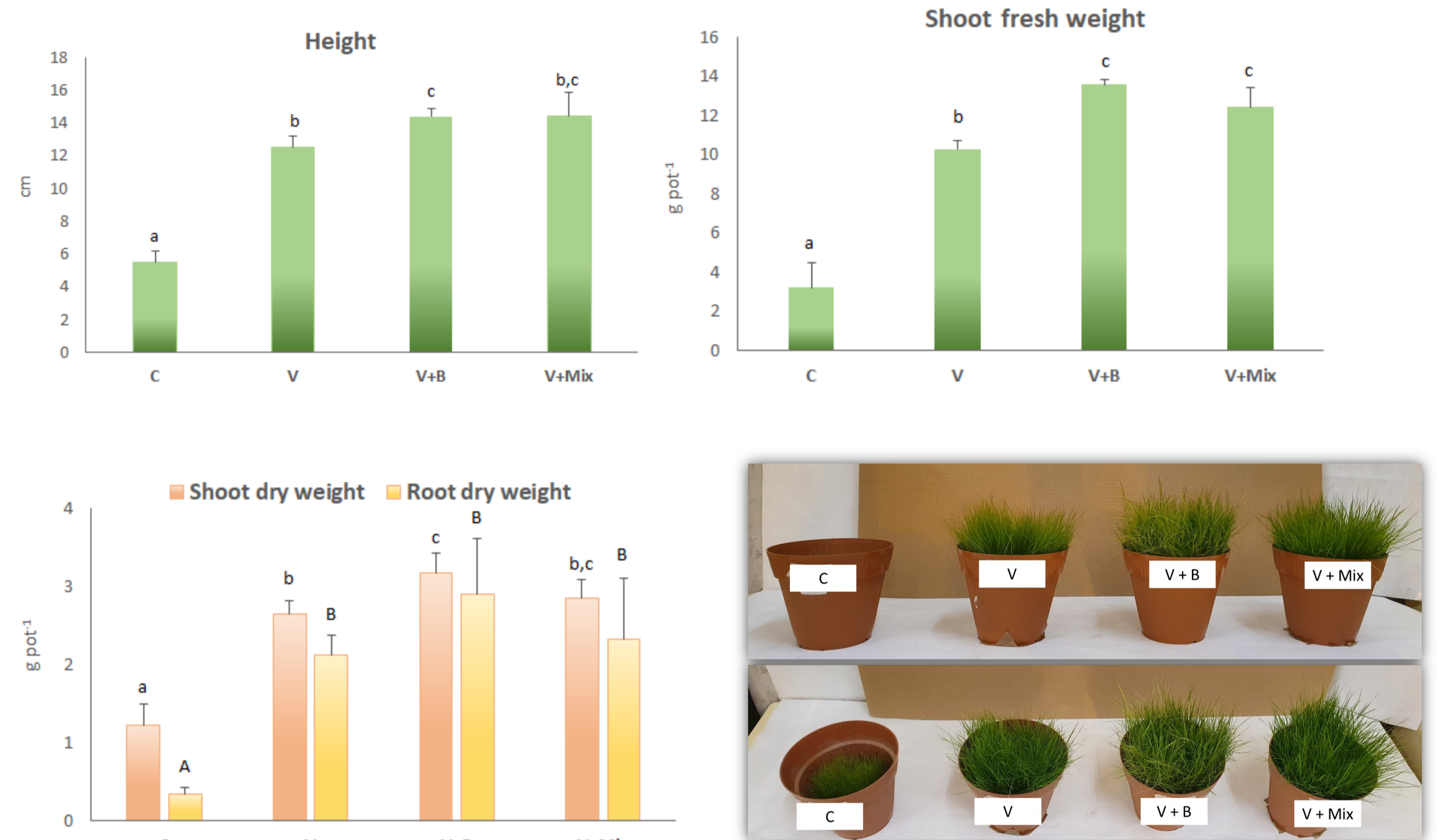
Siderophore production



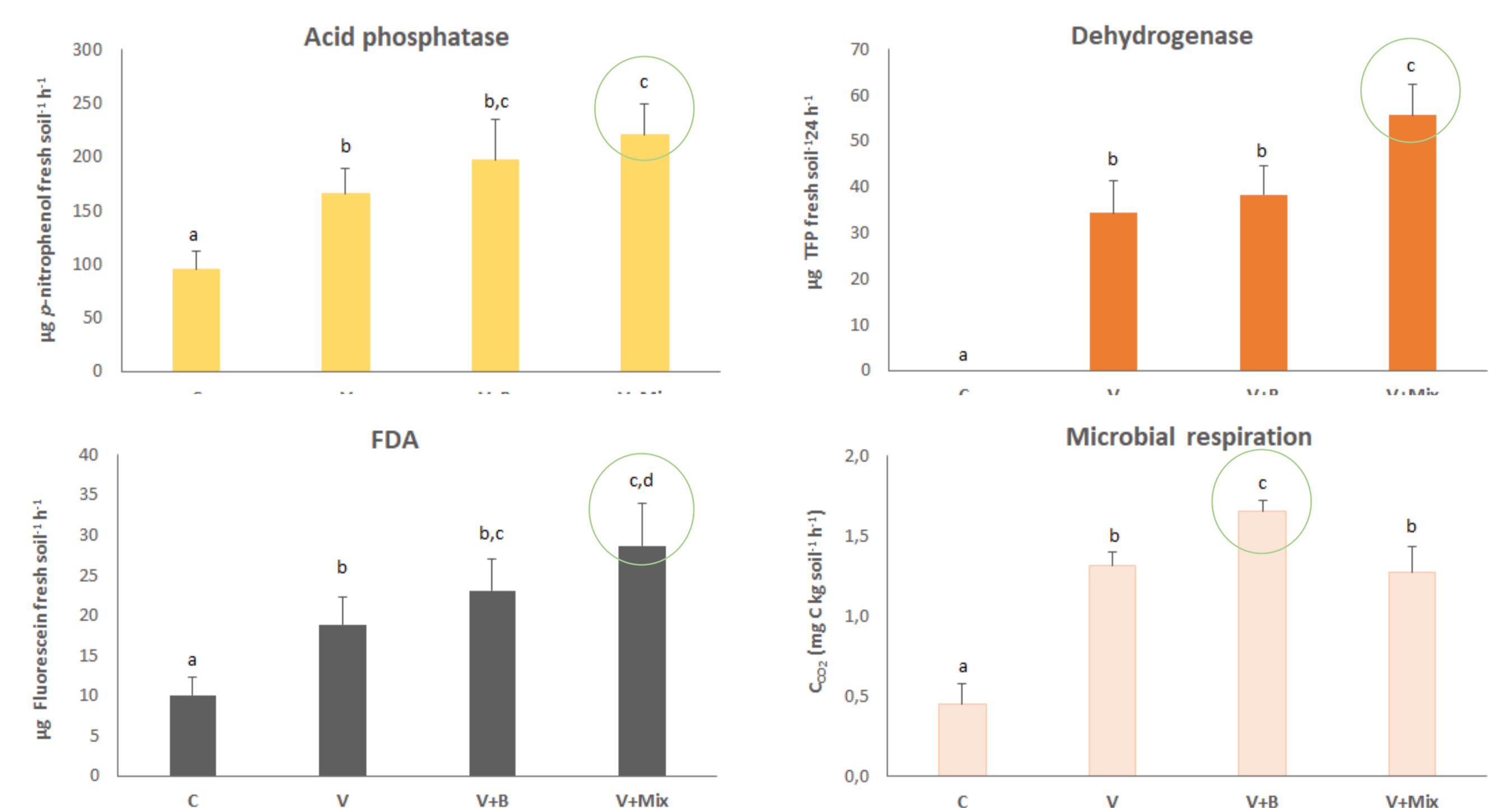
P solubilization



Plant Growth



Microbial Activity



- The addition of 10% of vermicompost to mine tailings significantly increased microbial Activity;
- Bioinoculation contributed to further increase the microbial activity.