

Effects of biochar and bioinocula on biomass and Cu accumulation of sunflower grown in a metal-contaminated mining soil



CATOLICA

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PORTO

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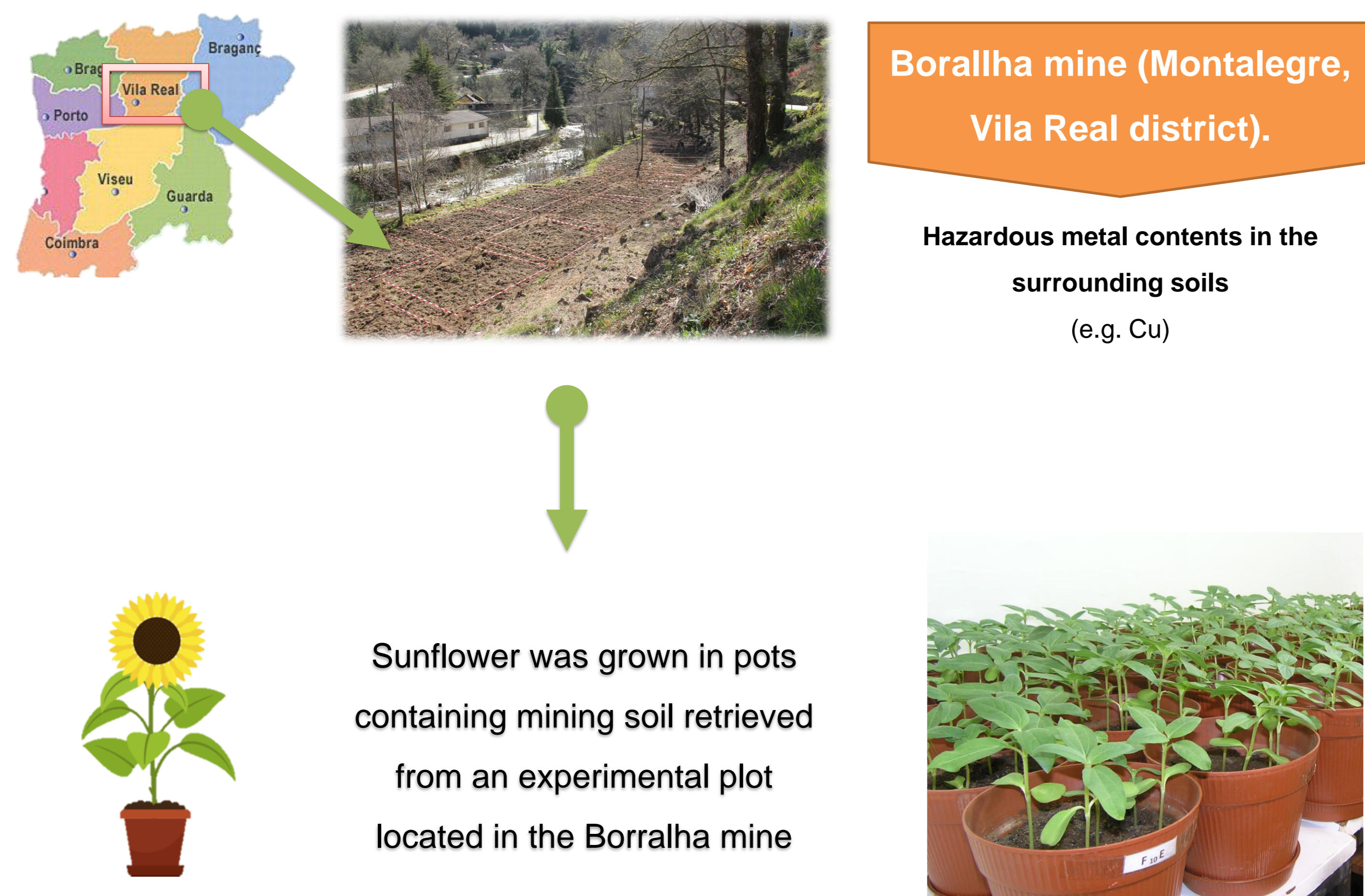
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Introduction

Soil metal contamination resulting from mining activities constitutes a major environmental problem worldwide. Therefore, the development of sustainable strategies for pollution control in abandoned mines is of utmost importance to reduce harmful impacts on the neighboring environment and on human health. Plant-based techniques (phytoremediation) appear as a sustainable alternative for the remediation of mining areas. Phytoremediation efficiency can be enhanced by the addition of soil amendments (e.g. Biochar) and microbial inoculants such as Plant Growth Promoting Rhizobacteria – PGPR and Arbuscular Mycorrhizal Fungi – AMF.

The main objective of this work was to evaluate the potential of biochar and of microbial inoculants as phytoremediation assistants, for sunflower growth promotion in a mining metal-contaminated soil.

Experimental Design

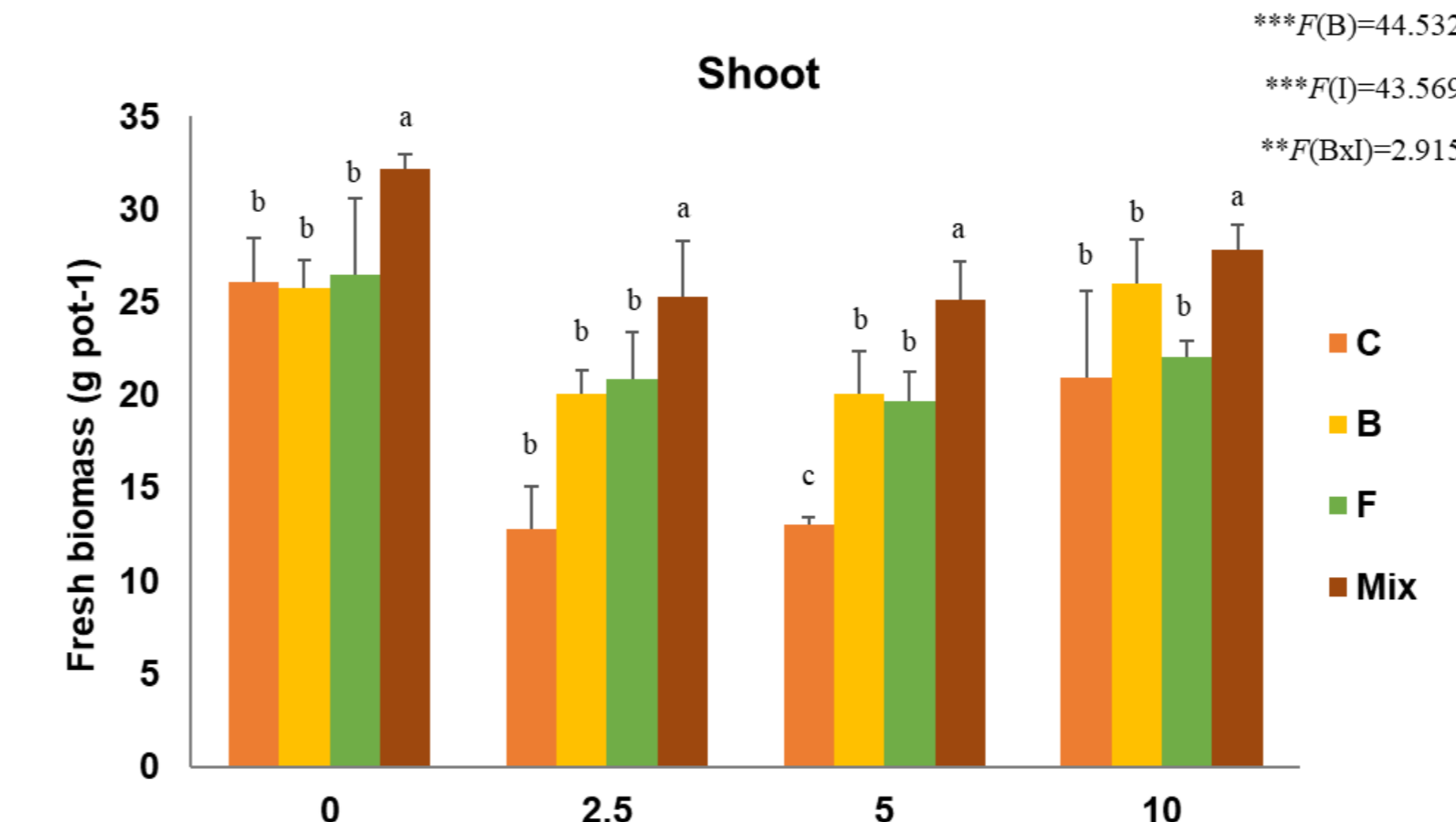


Experimental design:

4 microbial treatments	Biochar concentrations	Harvest (12 weeks)
<ul style="list-style-type: none"> • C - Control • B - <i>Pseudomonas reactans</i> (PGPR) • F - <i>Rhizophagus irregularis</i> (AMF) • Mix - B + F 	<ul style="list-style-type: none"> • 0% • 2.5% • 5% • 10% 	<ul style="list-style-type: none"> • Biometric parameters (Shoot biomass) • Metal accumulation

Results

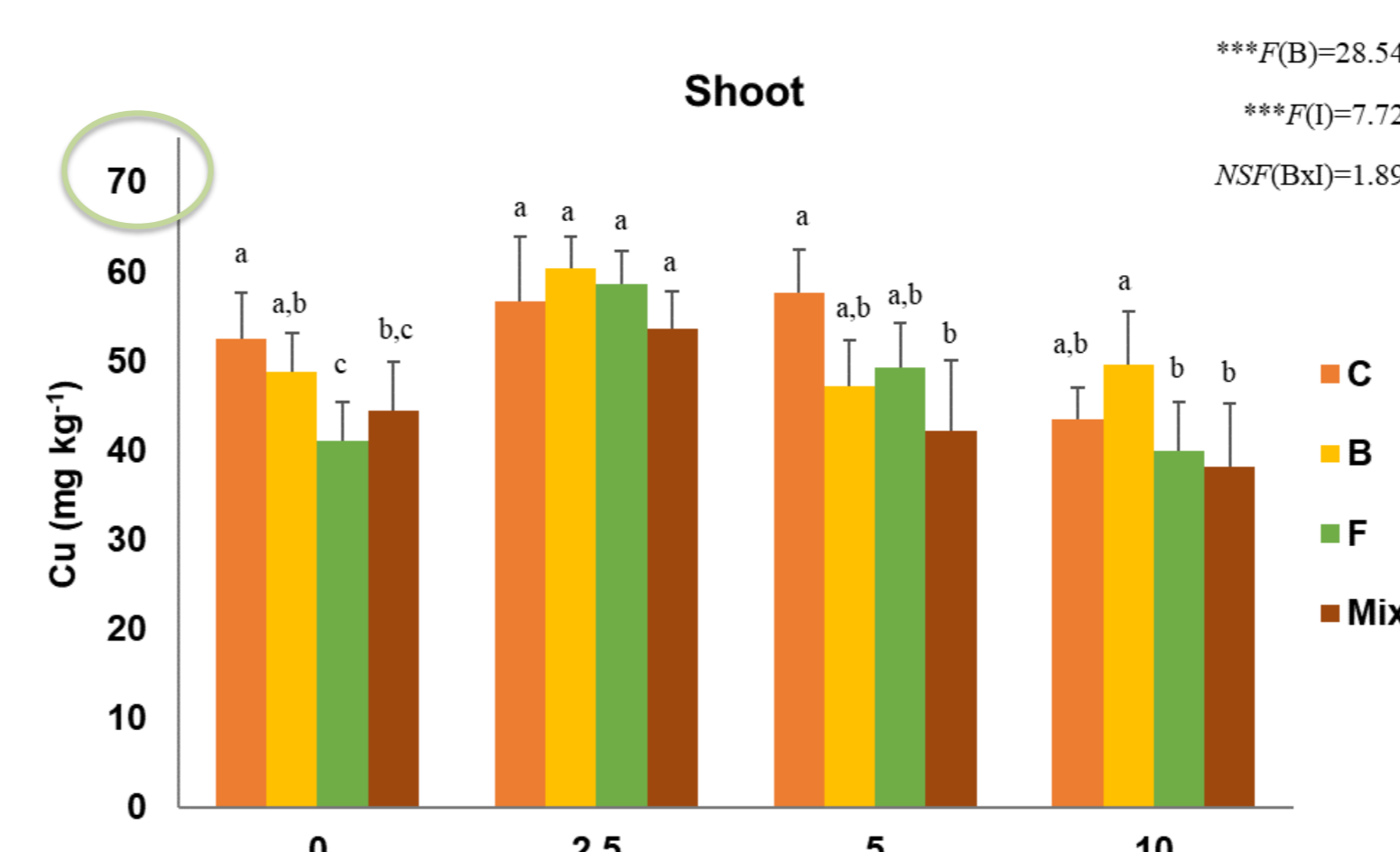
Biomass



Increasing BC levels significantly reduced fresh biomass

Microbial inoculation (in particular Mix treatment) enhanced significantly fresh biomass

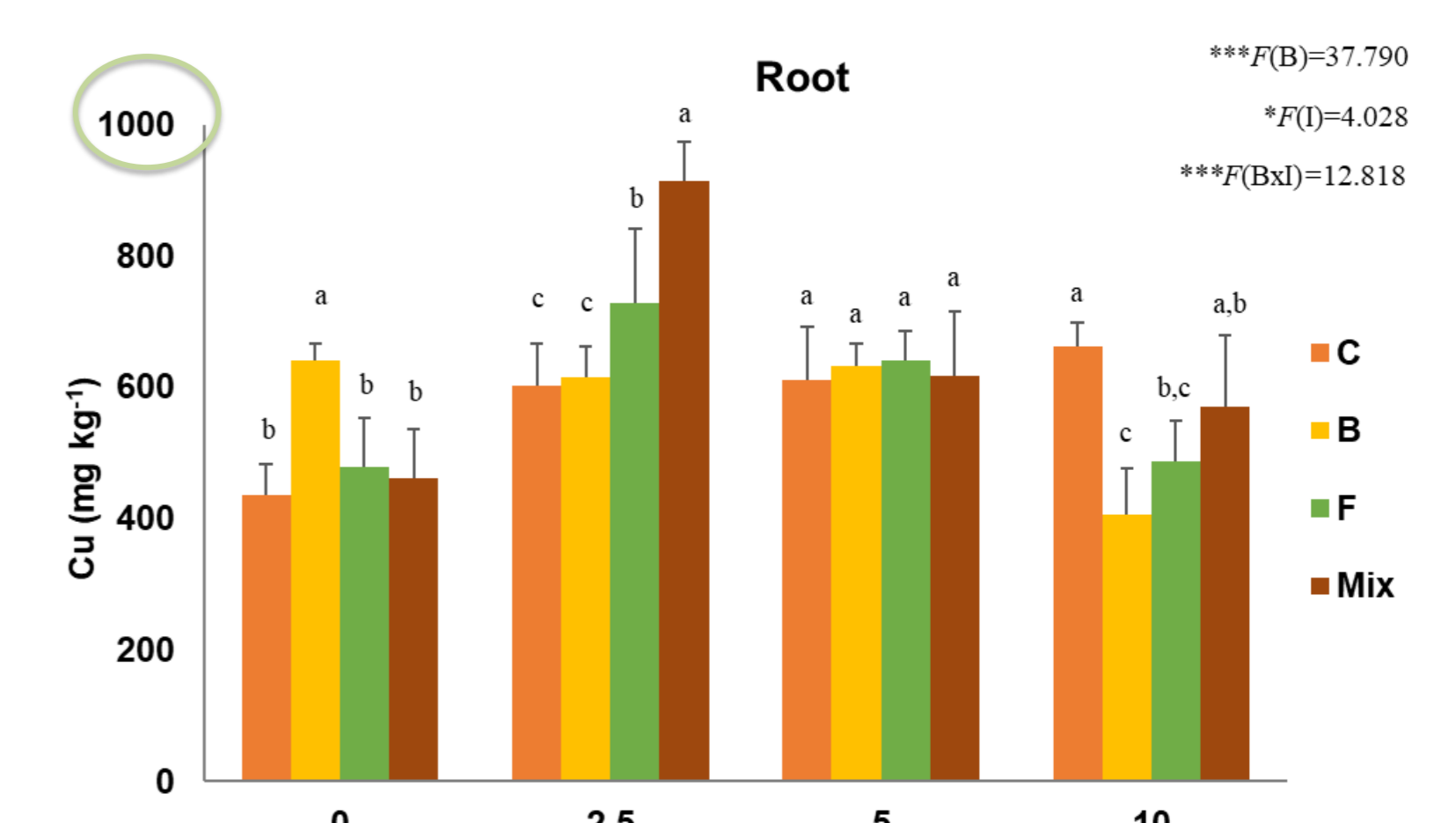
Cu accumulation



Cu accumulation was higher in roots

Plants grown at 2.5 and 5% of biochar accumulated higher Cu levels in both tissues

Microbial inoculation had a marginal effect on metal accumulation



Conclusions

- Microbial inoculation improved sunflower shoot biomass
- The combined inoculation of PGPR and AMF (Mix) was the most efficient treatment in improving sunflower growth
- Biochar addition significantly increased the accumulation of Cu in both plant tissues, which led to a decrease of plant biomass.
- The addition of biochar should be carefully analysed, particularly when dealing with biomass-based products where the reduction of plants productivity at metal high concentrations should be prevented

Acknowledgements

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