RESPONSE OF A SALT MARSH MICROBIAL COMMUNITY TO METALLIC NANOPARTICLES: IMPLICATIONS FOR PHYTOREMEDIATION PROCESSES

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1.Introduction and Aims

➢Although it is known that salt marsh plants can take up metals in a process known as phytoremediation, there is a lack of information about metallic nanoparticles (NPs) interaction with these plants. On the other hand, microbial communities display important roles in the salt marsh ecosystems, and plants can benefit from the microbial activity during phytoremediation processes. Nevertheless, depending on its levels and forms, metals can be toxic to microorganisms, fact that can eventually compromise their ecological functions.

➢In this vein, the aim of present study was to investigate, in the laboratory, the effect of Cu metallic NPs (as CuO) on the microbial communities associated to the roots of a salt marsh plant (***Halimione portulacoides***), and its implications for phytoremediation.

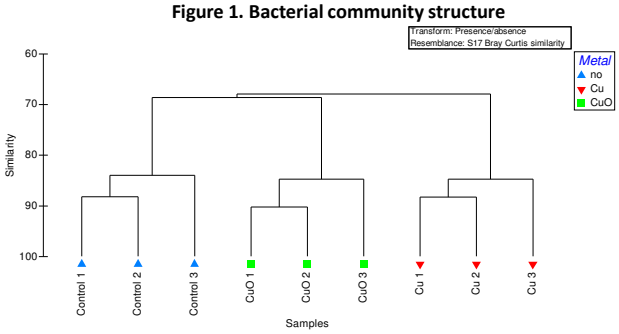
2. Experimental

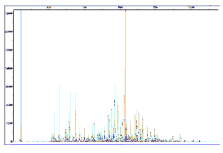
➢Experiments were conducted with sediment elutriate, a simplified natural medium, being the plant exposed for 1 week to medium contaminated (10 mg L^{-1}) either with CuO or with Cu (II).

➢Microbial community was characterized in terms of abundance (estimated by DAPI direct count method) and genetic structure (evaluated by Automated rRNA Intergenic Spacer Analysis – ARISA), and metal uptake was evaluated in plant tissues (by atomic absorption spectroscopy).

3. Results and Discussion

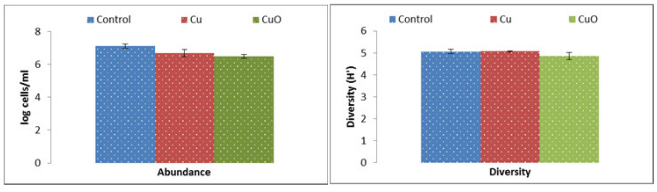
Figure 1. Bacterial community structure





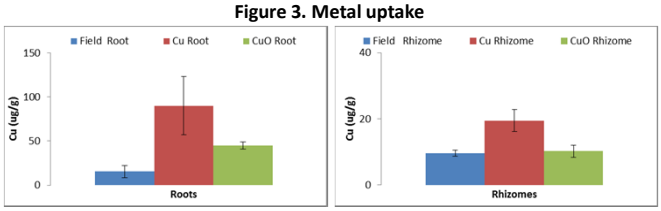
Cluster analysis, based on ARISA fingerprints, showed significant differences in the bacterial community structure, between treatments (tested ANOSIM). Higher dissimilarity was observed for the community exposed to Cu in ionic form.

Figure 2. Microbial abundance and diversity



No important differences in terms of microbial abundance or diversity

Figure 3. Metal uptake



Higher acumulation of Cu in roots and rhizomes exposed to Cu in ionic form than in the form of NPs

4. Conclusions

The study points to an higher bioavailability of Cu in ionic than in nanoparticle form, for both plants and microorganisms. These was shown by an higher accumulation of Cu in roots and rhizomes and an higher effect on microbial community structure.

Nevertheless, both forms of Cu promote a shift in the microbial community structure, with possibly effect on the ecological function of these microbial communities in salt marshes.

These changes may affect plants phytoremediation potential and further work on this subject is in need.

Acknowledgements

Research partially supported by the European Regional Development Fund (ERDF) through COMPETE - Operational Competitiveness Program and national funds through FCT, under PEst-C/MAR/LA0015/2013