EFFECTS OF A BIOCHAR AMENDMENT TO IMPROVE THE PHYSICOCHEMICAL CHARACTERISTICS OF A FORMER MINE EXTRACTION SOIL CONTAMINATED MAINLY BY Pb AND As AND TO ENHANCE THE GROWTH OF THREE WILLOW SPECIES

Sylvain Bourgerie[1], M. Lebrun[1], C. Macri[1], N. Hattab[1], F. Miard[1], M. Motelica-Heino[2], D. Morabito[1]

[1]University of Orleans, LBLGC INRA USC1328, Orleans, France

[2]CNRS – University of Orleans, ISTO, UMR 7327, France

sylvain.bourgerie@univ-orleans.fr

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Introduction

The industrial era has led to a great and wide metal(loid)s-pollution. This pollution is hazardous to the environment and for the public health. The rehabilitation of those sites is therefore a priority. For a long time, conventional techniques have been used to remedy some of these soils; however these proceedings are expensive, for this reason phytoremediation techniques are now of interest, especially phytostabilization using plants having a high biomass production. *Salicaceae*, willows and poplars, have a high biomass production and a metal(loid)s tolerance by the confinement of metal(loid)s in their roots, which make them potentially good phytostabilizators (Punshon and Dickinson, 1999). Moreover, phytostabilization can be enhanced by the application of amendments into the soil (Anawar et al., 2015). These amendments will improve soil characteristics, hence plant development and the metal(loid)s stabilization in the soil. The goals of our study were (i) to investigate the effects of 2 different amendments, topsoil and biochar alone and mixed and (ii) to assess the tolerance of three willow species, *Salix viminalis*, *Salix alba* and *Salix purpurea*.

Methods

The study was undertaken in a mesocosm using the soil from a former mine extraction site located at Pontgibaud (France). This site presents no vegetation cover and is mainly contaminated by high concentrations of lead (11453 $mg.kg^{-1}$) and arsenic (539 $mg.kg^{-1}$). This mine technosol was amended by two organic amendments, alone or combined: topsoil (50%) and biochar (0%, 2% or 5%). For each treatment, 18 replicates were prepared and each one was vegetalized by one willow cutting. Soil pore water was collected using soil moisture samplers (Rhizon™). Electrical conductivity (EC), pH and dissolved organic carbon (DOC) of the SPW were determined, as well as the metal(loid)s (As, Pb) by ICP-AES. Cuttings were grown for 63 days. Plant height was measured weekly. At the end of the growth period, all formed organs (leaves, stems, roots) were collected separately and dried to measure the dry weight. Metal(loid)s concentrations in the different organs were measured by ICP-AES.

Results

SPW characteristics (pH, EC, DOC, metal(loid)s concentration), *Salix* biomass and metal(loid)s plant repartition were determined. The results indicate that the organic amendments help to stabilize Pb. They also led to a better plant growth. Metal pollutants were found mainly into the roots system and were weakly translocate to the aerial parts.

Conclusion

We identified which one of the three willow species, combined with an amendment, was the most suitable tool to remediate this polluted site.

References

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