

Capabilities of Fe-Functionalized Biochar to Decrease Soil Pb and As Phytodisponibility

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Extended Abstract

Biochar, produced by the pyrolysis of biomass under low oxygen conditions, has gathered attention in the last few years due to its capability to reduce metal(loid)s bioavailability and mobility in soils [1], as well as its beneficial effects on soil fertility. Indeed, biochar amendment to polluted soil induced usually an increase of pH, water holding capacity and nutrient contents, associated with a decrease of metal(loid)s concentrations in soil pore water [2], through sorption. However, biochar has been shown efficient in sorbing cations pollutants, like Pb, but present a low sorption capacity towards anions like As. This contrasted behaviour poses a problem, as most polluted soils are multi-contaminated, with both cations and anions pollutants. One of the solution to overcome such problem is to functionalized biochar, by modifying its surface. However, most studies actually focused on functionalization effect on metal(loid)s sorption towards batch experiments, and only a few dealt with modified-biochar incorporation to the soil. Therefore, this study aimed (i) to assess the sorption capacity of hardwood biochars, harbouring different particle sizes, towards Pb and As; (ii) to evaluate the effect of a Fe-functionalization on Pb and As sorption and (iii) to validate the results, in a phytotoxicity test using *Phaseolus vulgaris* as bioindicator plant. The batch experiments showed all four biochars were able to efficiently sorb Pb, the fine biochars showing higher sorption values than the coarse biochars (85% vs 40% Pb sorption). As sorption was very low (less than 5%). Fe-coating increased As sorption value (by 10-fold), while having no effect on Pb sorption. However, when incorporated in the soil, Fe-coated biochar did not improve soil physico-chemical properties compared to the pristine biochar; especially it did not reduce As soil pore water concentrations (0.13 vs 0.10mg/L As concentrations). Finally, bean plant did not show differences in terms of biomass production between the two biochars incorporated into polluted soil, demonstrating that Fe-functionalization did not improve biochar capacity to decrease soil toxicity.

References

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