

EFFECT OF BIOCHAR ADDITION TO METAL-CONTAMINATED SOIL ON *PHASEOLUS VULGARIS*

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The soil of the Campine region in Belgium is polluted with metals such as cadmium (Cd), copper (Cu) and zinc (Zn) due to past industrialization (Schreurs *et al.*, 2011). When this soil is used for agriculture, these metals can accumulate in crops and cattle. To enlarge the available land to produce safe crops with high productivity, addition of biochar to the soil is considered a possible solution. Biochar has been proven to possess many advantages. When added to the soil, it can adsorb metals like Cd and hence reduce its bioavailability for plants (Li *et al.*, 2017). Pig manure is an interesting feedstock to pyrolyze into biochar because it is highly abundant in Belgium. To investigate the capability of this biochar type, pot experiments were performed to study the effect of biochar addition to polluted soil on *Phaseolus vulgaris*. The environmental norms of the Flemish government indicate the safe and allowed quantity (mg.kg^{-1} dry matter) of metals in a reference soil (10% clay, 2% organic matter). A metal-contaminated soil exceeding these guidelines for Cd, Cu and Zn for at least eighty percent was mixed with 0%, 1% or 2% pig manure-derived biochar. On the one hand, this experiment showed that the biomass of *P. vulgaris* (stems, leaves and beans) was dose-dependently enhanced by biochar application. On the other hand, metal determination in beans and leaves showed an opposite relation, mainly a biochar-related decrease in metal concentration. The latter was in most cases reflected in higher remains of metals in the soil. In conclusion, *P. vulgaris* grown on metal-contaminated soil mixed with pig manure-derived biochar showed a higher crop yield than plants without biochar. This enhanced growth seemed to be dose-dependent within the concentration range tested, but this should be further researched in other plant species and substrates. In addition, pig manure-derived biochar diminished the translocation of Cd, Cu and Zn to the aboveground parts of the plant. These results indicate that pig manure-derived biochar could be used to enhance the growth of crops and diminish the uptake and accumulation of metals, although further research on other feedstock-derived biochar is necessary.

References

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