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Remediation of Metal-Contaminated Soil Using Sucrose-Derived Carbon Foams: A Field Study with *Betula pubescens*

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Chemical stabilization is a sustainable and widely utilized method for soil remediation, particularly effective in immobilizing metals and reducing their mobility, which poses significant risks to both the ecosystem and human health. Recent studies have highlighted the potential of sucrose-derived carbon foams as sustainable and efficient stabilizing agents in laboratory-scale experiments (Janeiro-Tato et al., 2024). However, comprehensive assessments of their long-term effectiveness under field conditions remain scarce. Additionally, evaluating changes in contaminant bioavailability and plant uptake, particularly by tolerant plant species, is crucial for understanding the long-term sustainability of remediation efforts and for future plans to implement phytostabilization techniques.

This study explores the remediation of metal-contaminated soil using sucrose-derived carbon foams impregnated with FeO(OH) nanoparticles (Janeiro-Tato et al., 2022). A field experiment was conducted using *Betula pubescens* for the phytostabilization of a metal-contaminated soil, with the carbon foam applied as soil amendment during the transplantation period. Soil and plant samples were collected after 3 months and 12 months to assess contaminant availability in the soil and their accumulation in the plants. The results revealed a significant reduction in metal availability and metal accumulation in the plant, demonstrating the effectiveness of the carbon foams as a sustainable and efficient short-term remediation technique. These findings underscore the potential of carbon foams to enhance the phytostabilization of metals by *Betula pubescens*.

Our findings, together with future research, will provide valuable insights into the practical application of carbon-based materials for soil remediation, their environmental benefits, and their potential integration with phytoremediation techniques.

References

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