Biochar improves the yield and quality of Erigeron breviscapus in heavily cadmium-polluted soil

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March 17, 2023

Abstract

Simultaneous utilization and remediation of soils contaminated with cadmium (Cd) is a propitious and economically beneficial task. Here, we undertook a pot experiment with biochar application at four rates (0, 5, 10, and 15%, denoted as BC0, BC5, BC10, and BC15, respectively) with the addition of 0.1% Cd, along with a control without Cd and biochar addition (CK). Erigeron breviscapus, a raw medicinal material used to extract scutellarin, was grown in all treatments to investigate a new method of utilizing and remediating heavily Cd-contaminated soil. The results showed that the high Cd-contaminated soil decreased the yield and scutellarin content of E. breviscapus by 33.6% and 70.8%, respectively. Compared to BC0, the yield and scutellarin content in BC15 increased by 24.7% and 312.0%, respectively. Biochar application (BC5, BC10, BC15) changed the soil Cd speciation and reduced the soil available Cd content by 17.4–121.8% and plant Cd content by 26.4–42.6% compared with BC0. However, chlorophyll content, catalase (CAT) activity, and acquisition of N, Fe²⁺ and Cu²⁺ of E. breviscapus increased in BC5, BC10, and BC15 compared to BC0. Additionally, the mitigation effect of Cd toxicity enhanced with increasing biochar application, and 15% biochar application resulted in the highest yield and scutellarin content of E. breviscapus. This study highlights the importance of biochar for improving the Cd adaptability of E. breviscapus and provides a reference for the simultaneous utilization and remediation of heavily Cd-contaminated soil.

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