

Article

The Effect of Cysteine on the Removal of Cadmium in Paddy Soil by Combination with Bioremediation and the Response of the Soil Microbial Community

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Table S1 Steps in the determination of Cd fractionation in the soil by Tessier sequential extraction method

Step	Fraction	Operation sequence
1	Exchangeable fraction (F1)	8 mL of 1 mol/L magnesium chloride solution was added into 1.0 g soil in a 50 mL centrifuge tube, shaking at room temperature for 1 h (200 r/min) and then centrifuging for 10 min (4000 r/min)
2	Carbonate bound fraction (F2)	The residue from step 1 was leached with 8 mL of 1 mol/L sodium acetate at room temperature. Before extraction, the pH was adjusted to 5.0 with acetic acid, shaking for 8 h (200 r/min) and then centrifuging for 10 min (4000 r/min)
3	Iron/Manganese bound fraction (F3)	20 mL of 0.04 mol/L hydroxylamine hydrochloride in 25% (v/v) acetic acid solution was added into the residue after step 2 for extraction. The extraction temperature was 96 ± 3 °C with occasional agitation for 4 h. Centrifugation was done for 10 min (4000 r/min) and the supernatant removed and filtered
4	Organic matter bound fraction (F4)	3 mL of 0.02 mol /L nitric acid and 5 mL of 30% (V/V) hydrogen peroxide was added into the residue treated at step 3. The pH was adjusted to 2 with nitric acid, and

		<p>then the mixture was heated at 85 ± 2 °C for 2 h with occasional agitation. After that, 5 mL hydrogen peroxide was added and the pH was adjusted to 2. Then, samples were heated again at 85 ± 2 °C for 3 h and shaken intermittently. After cooling, 5 mL of 3.2 mol/L ammonium acetate in 20% (V/V) nitric acid was added and diluted to 20 mL and then shaken for 30 min. Centrifuge was done for 10 min (4000 r/min), supernatant removed, and the removed solution filtered. 50 mL volumetric flask was used to make the volume constant</p>
5	Residual fraction (F5)	<p>The residue from step 4 was digested and analyzed by the nitric acid-hydrofluoric acid-perchloric acid digestion method</p>

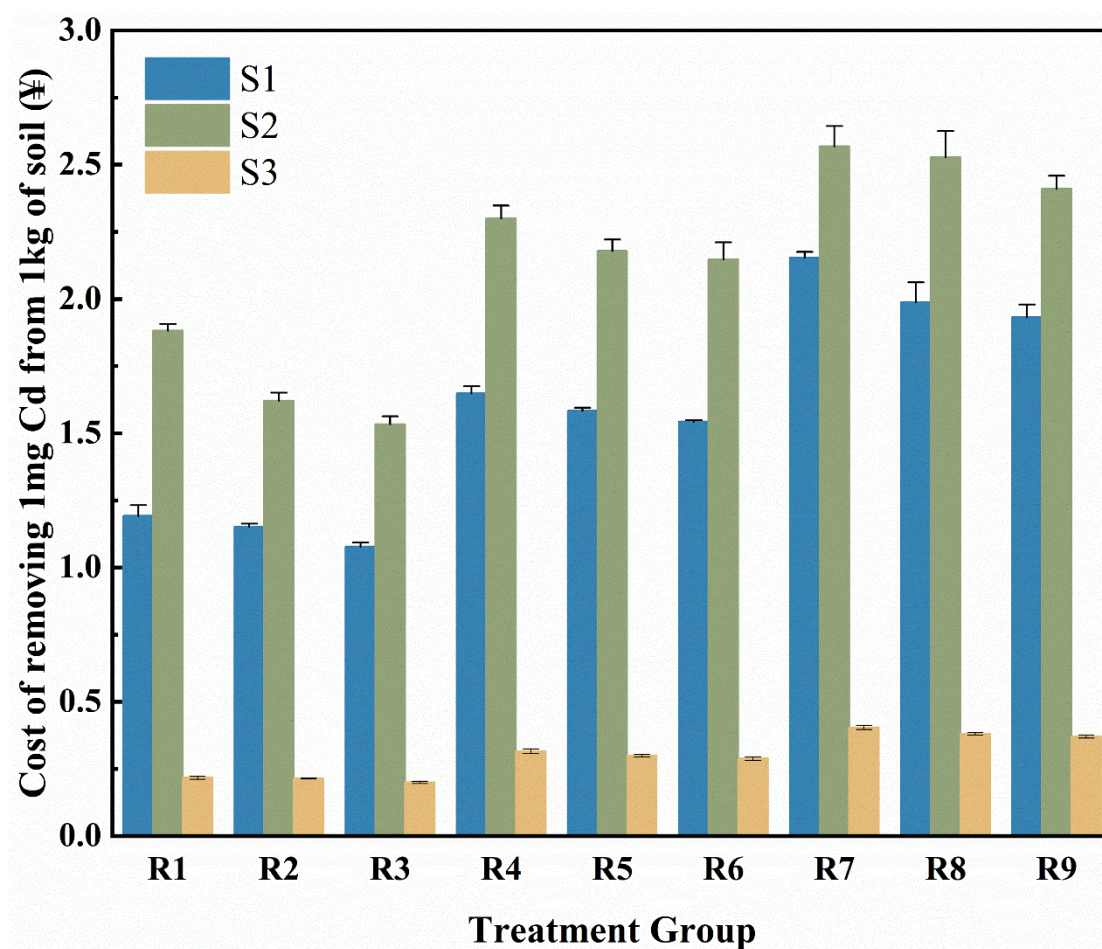


Figure S1 Economic benefits analysis of different treatments

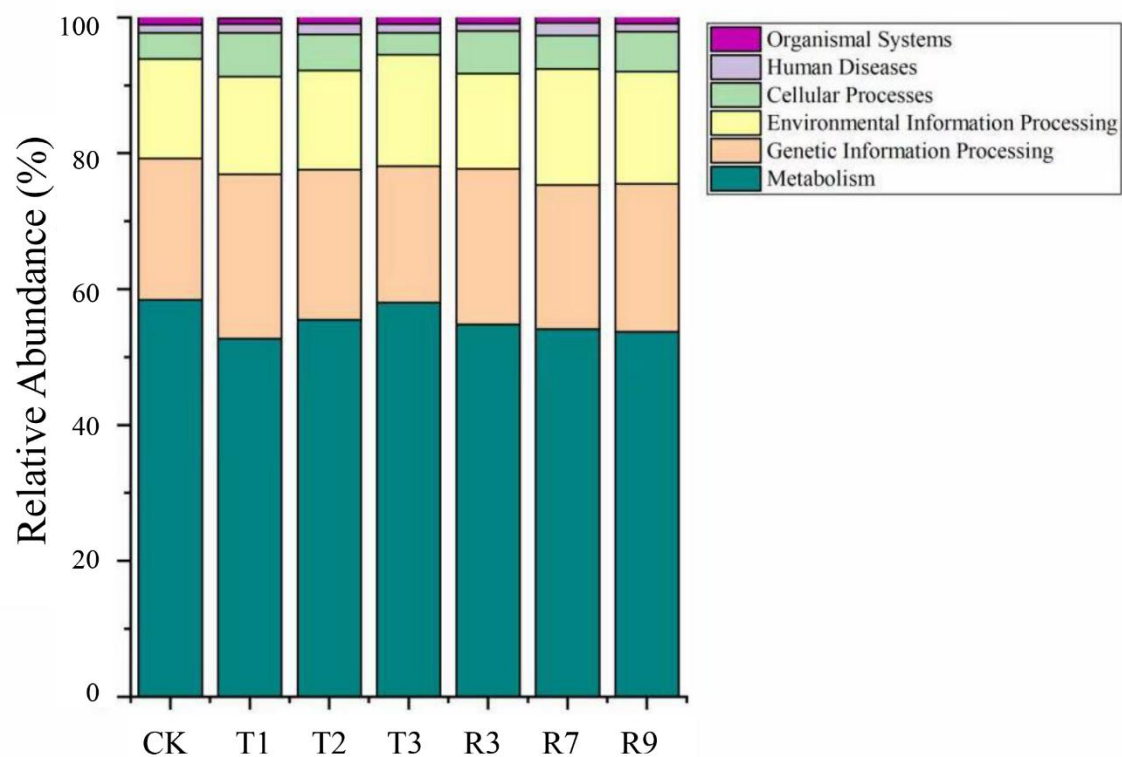


Figure S2 Microbial metabolic functional pathways in selected soil samples at level 1