Chemical Ameliorants to Immobilize Cadmium in Paddy Soils Adjacent to the Closed Mines in Korea. (5179)

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Abstract:
Recently, contamination of the rice paddy soil adjacent to closed and abandoned metal mines has been a hot environmental issue in Korea due to the accumulation of toxic metals in crop. The concentrations of Cd in rice grains grown on soils contaminated by mining activity in Korea generally exceeds safety guidelines of KDFA, 0.2 mg kg$^{-1}$. Numerous studies have been conducted to remediate highly contaminated soil such as mining sites but little was done on moderately contaminated paddy soil. Greenhouse experiment was conducted on Cd-contaminated paddy soils from Geopung metal mines in Korea to stabilize Cd using humus, lime, compost and zero-valent iron (ZVI). Inhibition of Cd uptake in grains of rice ($Oriza sativa$ L.) was determined comparatively among the treatments. Sequential extraction of rice paddy soil revealed bioavailable Cd was more reduced as 39 ~ 99% in exchangeable form and 29 ~ 54% in adsorbed form than control by chemical treatments. The efficiency of Cd uptake inhibition was ZVI (69%), lime (64%), ZVI + humus (51%), compost (42%), humus (24%), and ZVI + compost (22%). In contaminated rice paddy soil, ZVI was most effective in inhibiting Cd translocation to rice grains. ZVI treatment did not significantly reduce rice yield as 2.5 ton ha$^{-1}$ comparing to control, 2.7 ton ha$^{-1}$. ZVI can be used to stabilize Cd-contaminated paddy soil considering both efficiencies and rice yields.

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