Combining mercapto-functionalized palygorskite with zinc affect cadmium phytoavailability and soil microbial activity in rhizosphere soil

Yulong Li[1], Chao Gao[1], Sashuang Rong[1], Jialin Gu[2], Huiwei Zhao[3], Shiming Su[4], and wei liu[1]

[1]Hebei University
[2]Beijing Academy of Agricultural and Forestry Sciences
[3]National Semi-Arid Agricultural Technology Research Center
[4]Chinese Academy of Agricultural Sciences

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Abstract

Cadmium (Cd) pollution in soil pose a grave threat to human health. Combining various approaches to reduce Cd accumulation in crops is an active area of research to remediate farmlands with medium-high levels of Cd contamination. The Mercapto-functionalized palygorskite (PGS-SH) and zinc (Zn) application alone or in combination was investigated to explore reduction of Cd uptake in B. chinensis L and transformation of Cd in soil. The sole application of Zn or PGS-SH increased the biomass of B. chinensis L. and decreased the concentration of Cd in plants, but more improvements were observed from the combined application of Zn and PGS-SH. Low concentration of exogenous Zn (50 mg/kg) significantly increased the soil respiration rate (SRR) and the soil dehydrogenase activity (sDHA), while promoted B. chinensis L. growth while inhibiting Cd uptake. However, excessive exogenous Zn ([?] 200 mg/kg) significantly inhibited B. chinensis L. growth and soil microbial activity. The combined application of PGS-SH and Zn had the highest sDHA (145.59%) and lowest transport factor (TF) (27.59%) compared with the CK. The combination of PGS-SH and Zn fertilizer is a safe and effective means for remediating Cd-contaminated soil and restoring microbial activity.

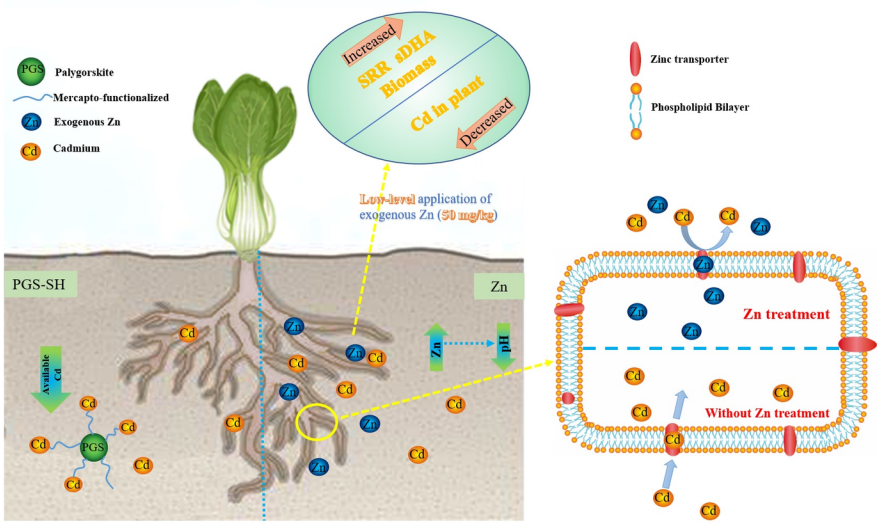
Highlights:

Mercapto-functionalized palygorskite is an excellent Cd stabilizer in soil.

Exogenous Zn significantly reduced Cd uptake in *Brassica chinensis* L.

Low-level exogenous Zn treatment (50 mg/kg) significantly increased the SRR and sDHA.

The combination of PGS-SH and Zn is feasible for remediation of Cd-contaminated soil.



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