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不同超富集、富集植物-玉米间作模式对玉米中镉吸收、转运的影响研究

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Abstract: In order to study the characteristics of heavy metal Cd absorption and transportation due to intercropping maize and *Amaranthus mangostanus* L., *Lolium perenne* L. and *Solanum nigrum* L. under Cd contamination conditions, we selected accumulators suitable for maize intercropping and achieved remediation of heavy metal contaminated soil. In this paper, we used the Cd contaminated brown clay from Henan Province as test soil. In pot experiments, we studied the mechanism of Cd accumulation, absorption and transportation due to intercropping hyperaccumulator *S. nigrum* and accumulators *Lolium perenne* L. and *Amaranthus mangostanus* L., based on the changes of Cd contents in various organs of maize and changes of enrichment coefficient, translocation coefficient, total Cd in soil and available Cd content. The results showed that (1) intercropping significantly decreased Cd contents in above ground parts of maize ($P < 0.05$), with maximum decrease in maize grain, where the Cd contents decreased by 67.6%, 75.7% and 79.9% under intercropping *Amaranthus mangostanus* L., *Lolium perenne* L. and *S. nigrum*, respectively; (2) compared with monocropping, intercropping the three plants decreased the Cd enrichment factor in maize by 49.3%, 39.7% and 68.5%, respectively; and (3) intercropping *S. nigrum* decreased the Cd transfer factors in maize by 27.5% and 24.2% compared with *Amaranthus mangostanus* L. and *Lolium perenne* L., respectively, and the difference reached a significant level. Safety value calculation for daily Cd uptake indicated that after intercropping treatments, the total Cd content should be less than $2.26 \text{ mg} \cdot \text{kg}^{-1}$ and effective Cd content lower than $0.88 \text{ mg} \cdot \text{kg}^{-1}$. Therefore, intercropping ameliorates Cd exposure risk for maize consumption in the contaminated farmland. In conclusion, intercropping *Amaranthus mangostanus* L., *Lolium perenne* L., *S. nigrum* and maize could inhibit both Cd uptake by maize and Cd transfer from maize roots to shoots or specially roots to grain. This scheme of intercropping not only reduces Cd accumulation in maize and ensures the safety and high quality of maize planting, it also achieves the purpose of soil remediation.

Key words: Cd; maize; intercropping; absorption and translocation mechanism

摘要:为了研究Cd污染条件下,玉米分别与苋菜、黑麦草、龙葵间作对重金属Cd吸收和转运的特点,从而选择适宜与玉米间作的富集植物,同时达到修复重金属Cd污染土壤的目的。该文以镉(Cd)污染的河南棕壤

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