Characteristics of Bio-availability and Accumulation of Heavy Metal Elements in Soil-Crop System in Black Soil Area of Jilin Province

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Abstract: The middle part of Jilin Province in China is a major part of the northeast black soil zone, which is one of the three black earth terrains in the world. Soil in this region is of deep layers and high organic content. However, frequent occurrence of heavy metal contamination in this region due to the industrial manufacture and many other human activities has caught the attention of scholars in relavent disciplines. And monitoring of the bio-availability of heavy metals along with the total content become an important method to prevent the contamination. Therefore, on the basis of systematical soil geochemistry investigation in black soil area in the middle of Jilin province, this paper analyzes and counts the characteristics of bio-availability coefficients(soil bio-available content/soil total content) and accumulation coefficients (element content of corn seeds/ soil total content)of heavy metal elements(As, Cd, Cr, Cu, Ni, Zn) in soil-crop system.

Fig 1 Mean value of Bio-availability and Accumulation Coefficients of sampling in studied area

Element	Bio-availability Coefficients /%	Accumulation Coefficients /%
As	0.19	0.05
Cd	34.42	1.10
Cr	0.53	0.10
Cu	7.37	2.35
Ni	9.09	0.60
Zn	3.94	10.30

(Note: n=62, the mean indicates arithmetic average.)

The results indicate:1) Heavy metal contents of soil and corn seeds in study area are all below the limits of national soil environmental quality standard of China, which indicates no contamination. 2) The sequence of bio-availability coefficients is As< Cr< Zn< Cu< Ni< Cd and their variations are relatively high. The sequence of accumulation coefficients is As< Cr< Ni< Cd <Cu< Zn and their variations are relatively low. 3) The accumulation coefficients of 6 heavy metal elements are relatively low in corn seeds collected from the studied area. Under the uncontaminated situation, Cu and Zn are soil nutrients for corn plant which makes them top the accumulation coefficients rank; Cd is of high bio-availability and high accumulation degree. Attentions should be paid to the prevention and treatment of Cd in this region; The bio-availability coefficients of As and Cr are relatively low and it