

Supplementary Materials

Ecological and health risk assessment of heavy metal in farmland in the south of Zhangbei County, Hebei Province

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Table S1. Risk screening values for soil contamination of agriculture land

Land use type	elements	Risk screening values			
		pH≤5.5	5.5<pH≤6.5	6.5<pH≤7.5	pH>7.5
other	Cd	0.3	0.3	0.3	0.6
	Hg	1.3	1.8	2.4	3.4
	As	40	40	30	25
	Pb	70	90	120	170
	Cr	150	150	200	250
	Cu	50	50	100	100
	Ni	60	70	100	190
	Zn	200	200	250	300

Table S2. Classification standard of Potential Ecological Risk of heavy metal in soils

Ecological Risk Index (E _i)	Total Potential Ecological		Assessment	Level
	Risk Index (RI)			
E _i <40	RI<110		light	I
40≤E _i <80	110≤RI<220		medium	II
80≤E _i <160	220≤RI<440		severe	III
160≤E _i <320			intensity	IV
E _i ≥320	RI≥440		strong	V

Table S3. Exposure parameter values of health risk assessment

Parameters	Description	Units	Values		References
			Adults	Children	
C	Measured heavy metal content	mg·kg ⁻¹			In this study
IngR	Ingestion rate of soil	mg·d ⁻¹	100	200	(Zhao et al. 2019)
EF	Exposure frequency	d·a ⁻¹	350	365	(Hertzberg et al. 2000)
ED	Exposure duration	years	30	6	(Hu et al. 2020)
BW	Average body weight	kg	61.8	16.2	(Zhao et al. 2019)
AT	Average body weight	d	365*ED (non-carcinogenic) 70*365 (carcinogenic)		(Huang et al. 2021)
CF	Conversion factor from kg to mg	kg·mg ⁻¹	10 ⁻⁶	10 ⁻⁶	(Hu et al. 2020)
PEF	Emission factor	m ³ ·kg ⁻¹	1.36×10 ⁹	1.36×10 ⁹	(Zhao et al. 2019)
InhR	Inhalation rate	m ³ ·d ⁻¹	15	7.5	(Zhao et al. 2019)
SA	Surface area of skin	cm ²	4350	1600	(Hu et al. 2020)

SL	Skin adherence factor	$\text{mg} \cdot (\text{cm}^2 \cdot \text{d})^{-1}$	0.2	0.2	(Huang et al. 2021)
ABS	Dermal absorption factor	uniteless	0.001	0.001	(Zhao et al. 2019)

Table S4. Heavy metal exposure reference dose (RFE_i) and slope factor (CSF_i)

Elements	RFE _i (mg·kg ⁻¹ ·d ⁻¹)			CSF _i ((mg·kg ⁻¹ ·d ⁻¹) ⁻¹)			References
	Ingestion	Inhalation	Dermal contact	Ingestion	Inhalation	Dermal contact	
Cd	1.00×10 ⁻³	1.00×10 ⁻³	2.5x10 ⁻⁵	6.10	1.80×10 ⁻³	6.10	(Hui et al. 2021; Yakamercan, Ari, and Aygün 2021)
Cu	4.00×10 ⁻²	4.02×10 ⁻²	1.2x10 ⁻²	ND	ND	ND	(Yakamercan, Ari, and Aygün 2021)
Pb	3.50×10 ⁻³	3.52×10 ⁻³	5.24x10 ⁻⁴	ND	ND	ND	(Yakamercan, Ari, and Aygün 2021)
Zn	3.00×10 ⁻¹	3.00×10 ⁻¹	6x10 ⁻²	ND	ND	ND	(Yakamercan, Ari, and Aygün 2021)
Cr	3.00×10 ⁻³	2.86×10 ⁻⁵	6x10 ⁻⁵	ND	42	ND	(Yakamercan, Ari, and Aygün 2021)
As	3.00×10 ⁻⁴	1.23×10 ⁻⁴	1.23x10 ⁻⁴	1.50	4.30×10 ⁻³	1.50	(Yakamercan, Ari, and Aygün 2021; Lim et al. 2008)
Hg	3.00×10 ⁻⁴	3.00×10 ⁻⁴	1.84x10 ⁻³	ND	ND	ND	(Yakamercan, Ari, and Aygün 2021)
Ni	3.00×10 ⁻⁴	1.23×10 ⁻⁴	1.23x10 ⁻⁴	ND	8.40×10 ⁻¹	ND	(Yakamercan, Ari, and Aygün 2021)

Table S5. PCA analysis in oats soil.

elements	PC1	PC2	PC3
Cd	0.598	-0.36	0.787
Cu	0.9	0.022	-0.277
Pb	-0.388	0.875	0.201
Zn	0.855	0.142	-0.375
Cr	0.772	0.527	-0.128
As	-0.087	0.972	0.021
Hg	0.585	-0.068	0.801
Ni	0.961	-0.067	-0.198
Cumulative total variance(%)	48.972	74.204	93.879

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