

SUPPLEMENTARY MATERIAL

Toxic elements in soil and rice in Ecuador

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Table S1. Total metal concentrations (mg kg^{-1}) in rice plant, leaves and stems, from different areas of Ecuador (mean \pm SD). P indicates the existence of significant differences among sites.

	Coastal provinces		Oriental province (Orellana)		P	
	Stem	Leaf	Stem	Leaf	Stem	Leaf
mg kg^{-1}						
Cr	1.992 \pm 1.704	4.485 \pm 4.437	0.521 \pm 0.861	0.732 \pm 0.475	<0.05	<0.05
Zn	29.92 \pm 16.63	19.32 \pm 6.80	18.66 \pm 3.016	14.54 \pm 7.52	ns	ns
Pb	0.056 \pm 0.041	0.278 \pm 0.905	0.021 \pm 0.029	0.023 \pm 0.031	<0.05	ns
Cd	0.160 \pm 0.330	0.06 \pm 0.056	0.219 \pm 0.120	0.087 \pm 0.086	ns	ns
Cu	3.520 \pm 3.174	4.599 \pm 2.124	5.428 \pm 2.459	9.060 \pm 4.109	ns	<0.05
As	0.998 \pm 4.451	0.344 \pm 0.293	0.042 \pm 0.042	0.047 \pm 0.018	ns	<0.05
Ni	1.764 \pm 1.370	2.775 \pm 2.929	0.438 \pm 0.330	0.487 \pm 0.239	<0.05	ns

Table S2. Pearson's correlation matrix for Fe oxyhydroxides, As, and toxic metals. n.s.: not significant

	Cr	Ni	Cu	Zn	As	Cd	Pb
Fe oxihidróxidos	-0.899 p<0.001 n=14	-0.807 p<0.001 n=14	-0.512 p<0.05 n=14	-0.487 ns n=14	-0.226 ns n=14	-0.147 ns n=14	-0.227 ns n=14
Cr	0.519 p<0.01 n=91	0.284 p<0.01 n=91	0.173 ns n=91	0.158 ns n=91	-0.315 p<0.01 n=91	0.151 ns n=91	
Ni		0.794 p<0.001 n=91	0.649 p<0.001 n=91	0.743 p<0.001 n=91	0.372 p<0.001 n=91	0.488 p<0.01 n=91	
Cu			0.780 p<0.001 n=91	0.703 p<0.001 n=91	0.501 p<0.001 n=91	0.519 p<0.001 n=91	
Zn				0.744 p<0.001 n=91	0.694 p<0.001 n=91	0.679 p<0.001 n=91	
As					0.550 p<0.001 n=91	0.756 p<0.001 n=91	
Cd						0.643 p<0.001 n=101	

Table S3. Total metal concentrations (mg kg^{-1}) in field rice grain samples from the different provinces of Ecuador (mean \pm SD). n.a.: not analyzed

Province	Cr	Zn	Pb	Cd	Cu	As	Ni
Guayas (n = 22)	1.146 \pm 1.157	24.05 \pm 8.87	0.118 \pm 0.183	0.047 \pm 0.138	3.327 \pm 1.382	0.079 \pm 0.051	1.420 \pm 1.196
Los Ríos (n = 9)	1.721 \pm 2.393	22.88 \pm 4.10	0.032 \pm 0.082	0.045 \pm 0.071	3.706 \pm 1.451	0.025 \pm 0.039	1.356 \pm 0.587
El Oro (n = 5)	n.a.	n.a.	0.037 \pm 0.015	0.379 \pm 0.418	n.a.	0.186 \pm 0.040	n.a.
Coastal provinces (n=36)	1.313 \pm 1.592	23.71 \pm 7.73	0.085 \pm 0.153	0.093 \pm 0.215	3.437 \pm 1.389	0.080 \pm 0.067	1.401 \pm 1.046
Orellana*	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Ecuador (n = 36)	1.313 \pm 1.592	23.71 \pm 7.73	0.085 \pm 0.153	0.093 \pm 0.215	3.437 \pm 1.389	0.080 \pm 0.067	1.401 \pm 1.046

*: at the time of sampling the crop was in the vegetative stage.

1. Statistics

A. Pearson's correlation coefficients between total metal concentrations in soil. Larger correlations are indicated in bold.

Cr	Co	Ni	Cu	Zn	As	Cd	Pb	
1.0000	0.2247	0.5409	0.3577	0.2909	-0.0573	-0.3118	-0.2944	Cr
	1.0000	0.5027	0.3951	0.2802	0.4128	0.3718	0.3936	Co
		1.0000	0.6730	0.6452	0.5834	0.3195	0.4818	Ni
			1.0000	0.7477	0.5313	0.3555	0.3880	Cu
				1.0000	0.6104	0.5939	0.5652	Zn
					1.0000	0.5398	0.8417	As
						1.0000	0.6627	Cd
							1.0000	Pb

B. Pearson's correlation coefficients between Mehlich concentrations in soil. Larger correlations are indicated in bold.

As	Cr	Co	Ni	Cu	Zn	Cd	Pb	
1.0000	0.3569	0.2258	0.2348	-0.1250	0.1534	-0.1138	0.1320	As
	1.0000	0.1973	0.3758	0.0959	0.0401	0.2262	0.1787	Cr
		1.0000	0.4235	0.2530	0.2872	0.3647	0.5806	Co
			1.0000	0.7177	0.2229	0.5537	0.7522	Ni
				1.0000	0.1332	0.5564	0.7485	Cu
					1.0000	0.3329	0.3640	Zn
						1.0000	0.6164	Cd
							1.0000	Pb

C. Pearson's correlation coefficients between grain concentration and Mehlich concentration in soil. Larger correlations are indicated in bold.

AsMelich	CrMelich	CoMelich	NiMelich	CuMelich	ZnMelich	CdMelich	PbMelich	Asgrain	Cdgrain	Pbgrain	Crgrain	Cograin	Nigrain	Cugrain	Zngrain	
1.0000	0.2967	0.1841	0.1599	-0.1594	0.1900	-0.1128	0.0810	0.1939	-0.0405	-0.0148	0.1661	-0.2113	0.0714	-0.3156	-0.5497	AsMelich
	1.0000	0.2767	0.3572	0.2319	0.1250	0.2370	0.1986	0.3803	0.0790	0.4448	-0.2837	-0.2244	-0.3450	-0.0609	0.1647	CrMelich
		1.0000	0.3968	0.2177	0.3224	0.4933	0.5594	0.4072	0.4953	0.5389	-0.2960	0.0691	-0.4002	-0.1352	0.0373	CoMelich
			1.0000	0.7390	0.2586	0.6786	0.7519	0.4450	-0.0034	0.2244	-0.3752	-0.3222	-0.3413	-0.0585	-0.0312	NiMelich
				1.0000	0.1385	0.7026	0.7467	0.2329	0.0806	0.3237	-0.4893	-0.2951	-0.4626	0.2203	-0.1204	CuMelich
					1.0000	0.2689	0.3977	0.0837	0.2753	0.3712	-0.3255	0.0341	-0.3190	-0.0274	-0.1641	ZnMelich
						1.0000	0.7700	0.3894	0.0270	0.3476	-0.4732	-0.3322	-0.4912	0.1848	-0.0311	CdMelich
							1.0000	0.3415	0.2297	0.5052	-0.4996	-0.2167	-0.5217	0.2199	-0.0509	PbMelich
								1.0000	0.1274	0.3198	-0.0325	-0.2400	-0.2552	-0.3572	0.2006	Asgrain
									1.0000	0.7549	-0.0798	0.5178	-0.0345	0.1886	0.0153	Cdgrain
										1.0000	-0.2521	0.3005	-0.2167	0.2888	0.1078	Pbgrain
											1.0000	0.0729	0.3816	-0.2653	-0.1416	Crgrain
												1.0000	0.4705	0.1287	0.1846	Cograin
													1.0000	0.0741	0.0703	Nigrain
														1.0000	0.1339	Cugrain

D. Pearson's correlation coefficients between Bioconcentration factor (grain/Mehlich), BCF, and Bioavailability ratio (Mehlich/Total), R. Larger correlations are indicated in bold.

BCF_Cr	BCF_Co	BCF_Ni	BCF_Cu	BCF_Zn	BCF_As	BCF_Cd	BCF_Pb	R_As	R_Cd	R_Pb	R_Cr	R_Co	R_Ni	R_Cu	R_Zn	
1.0000	-0.0325	-0.1529	-0.1494	0.3783	0.2858	-0.0116	-0.0708	-0.3058	0.1321	0.2923	-0.0755	-0.1695	-0.1638	0.1388	-0.2500	BCF_Cr
	1.0000	0.7478	0.7581	0.4700	0.4792	0.5942	0.7587	-0.3629	0.0959	-0.2538	-0.3858	-0.4621	-0.4209	-0.3490	-0.6011	BCF_Co
		1.0000	0.8767	0.3493	0.2973	0.6484	0.8171	-0.2617	-0.0705	-0.3175	-0.4214	-0.4939	-0.4424	-0.4904	-0.6243	BCF_Ni
			1.0000	0.4099	0.3029	0.7222	0.9244	-0.0289	-0.0703	-0.3320	-0.5400	-0.6367	-0.4652	-0.6982	-0.6477	BCF_Cu
				1.0000	0.6336	0.5310	0.5615	-0.3916	0.1515	0.1814	-0.3401	-0.3021	-0.2870	-0.3144	-0.5888	BCF_Zn
					1.0000	0.4880	0.4112	-0.5734	-0.0106	0.0761	-0.1005	-0.1995	-0.1410	-0.2396	-0.5549	BCF_As
						1.0000	0.8014	-0.1401	-0.0769	0.1850	-0.5150	-0.4638	-0.3646	-0.4597	-0.5793	BCF_Cd
							1.0000	-0.1053	-0.0684	-0.1062	-0.5705	-0.6837	-0.4943	-0.6019	-0.6632	BCF_Pb
								1.0000	-0.0284	0.2616	-0.1575	-0.1023	-0.2280	-0.1943	0.3997	R_As
									1.0000	0.7718	0.0363	0.1742	0.1442	0.0050	0.0120	R_Cd
										1.0000	-0.0410	0.7666	0.3120	0.4681	0.0397	R_Pb
											1.0000	0.4122	0.5092	0.2942	0.2403	R_Cr
												1.0000	0.9899	0.5670	0.8071	R_Co
													1.0000	0.1636	0.6582	R_Ni
														1.0000	0.5590	R_Cu