

Contents, distribution, and fractionation of soil organic carbon and trace elements in soils under a green manure application

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Electronic Supplementary Material (ESM)

Table S1. Chemical, physico-chemical, physical properties, and morphological characteristics of the Capillaric Uterquic Anthrosols

Soil properties	Horizons (depth, cm)			
	Ap (0–36)	Bt (36–94)	B1 (94–133)	Cg (133–152)
MgO (%)	1.57 ± 0.06*	2.14 ± 0.11	3.21 ± 0.19	2.79 ± 0.14
Al ₂ O ₃ (%)	12.36 ± 0.71	15.80 ± 1.12	13.27 ± 0.94	13.75 ± 0.79
SiO ₂ (%)	72.23 ± 5.17	69.44 ± 4.91	70.82 ± 5.32	70.687 ± 5.08
P ₂ O ₅ (%)	0.13 ± 0.01	0.09 ± 0.01	0.15 ± 0.02	0.12 ± 0.01
K ₂ O (%)	2.03 ± 0.08	1.84 ± 0.06	1.80 ± 0.07	2.34 ± 0.13
CaO (%)	1.54 ± 0.05	1.43 ± 0.05	1.17 ± 0.03	1.28 ± 0.04
TiO ₂ (%)	0.88 ± 0.05	0.83 ± 0.04	0.81 ± 0.04	0.89 ± 0.06
MnO (%)	0.24 ± 0.01	0.09 ± 0.01	0.10 ± 0.01	0.08 ± 0.01
Fe ₂ O ₃ (%)	5.47 ± 0.31	7.44 ± 0.49	6.67 ± 0.37	6.43 ± 0.33
pH _{H2O}	5.92 ± 0.21	6.13 ± 0.29	6.77 ± 0.30	6.65 ± 0.27
pH _{KCl}	5.00 ± 0.24	4.79 ± 0.19	5.93 ± 0.36	5.86 ± 0.27
Clay (g/kg)	520.42 ± 36.80	736.85 ± 59.05	744.27 ± 52.99	783.52 ± 61.67
Bulk density (g/cm ³)	1.00 ± 0.06	1.23 ± 0.08	1.41 ± 0.07	1.46 ± 0.09
Colour moist	black 7.5YR 2.5/1	black 7.5YR 2.5/1	strong brown 7.5YR 4/6	reddish yellow 7.5YR 6/6
Colour dry	very dark grey 7.5YR 3/1	dark grey 7.5YR 4/1	strong brown 7.5YR 5/8	reddish yellow 7.5YR 7/6

*the values are the means ($n = 6$), with standard deviations

Table S2. Correlation coefficients matrix (r) among the contents of the trace elements and the chemical and physical properties of the soils

	SOC	Clay	pH _{H2O}	pH _{KCl}	MgO	Al ₂ O ₃	SiO ₂	P ₂ O ₅	K ₂ O	CaO	TiO ₂	MnO	Fe ₂ O ₃	Cu total	Ni total	Pb total	Cr total	V total	Sr total	Cu WSC	Ni WSC	Pb WSC	Cr WSC	V WSC	Sr WSC
SOC	1.00																								
Clay	-0.93*	1.00																							
pH _{H2O}	-0.92	0.77	1.00																						
pH _{KCl}	-0.79	0.53	0.93	1.00																					
MgO	-0.91	0.80	0.98	0.87	1.00																				
Al ₂ O ₃	-0.26	0.58	-0.03	-0.36	0.07	1.00																			
SiO ₂	0.49	-0.77	-0.24	0.10	-0.34	-0.96	1.00																		
P ₂ O ₅	-0.20	-0.11	0.53	0.73	0.48	-0.80	0.62	1.00																	
K ₂ O	-0.26	0.08	0.12	0.31	-0.02	-0.25	0.26	-0.01	1.00																
CaO	0.89	-0.77	-0.98	-0.88	-0.99	-0.02	0.29	-0.53	0.04	1.00															
TiO ₂	0.08	-0.24	-0.20	0.02	-0.36	-0.32	0.44	-0.09	0.93	0.37	1.00														
MnO	0.88	-0.99	-0.70	-0.43	-0.74	-0.67	0.83	0.21	-0.04	0.70	0.26	1.00													
Fe ₂ O ₃	-0.49	0.76	0.29	-0.06	0.41	0.92	-0.98	-0.52	-0.40	-0.37	-0.58	-0.82	1.00												
Cu total	0.92	-0.96	-0.71	-0.51	-0.71	-0.54	0.70	0.78	-0.33	0.66	-0.01	0.95	-0.65	1.00											
Ni total	-0.52	0.67	0.53	0.23	0.66	0.56	-0.72	0.01	-0.66	-0.66	-0.87	-0.69	0.82	-0.46	1.00										
Pb total	0.37	-0.02	-0.51	-0.77	-0.36	0.73	-0.59	-0.70	-0.70	0.38	-0.58	-0.07	0.62	0.14	0.43	1.00									
Cr total	0.01	0.26	-0.37	-0.56	-0.34	0.80	-0.65	-0.97	0.20	0.40	0.22	-0.35	0.53	-0.37	-0.02	0.53	1.00								
V total	0.81	-0.95	-0.66	-0.35	-0.74	-0.72	0.88	0.20	0.11	0.84	0.48	0.97	-0.90	0.86	-0.84	-0.23	-0.30	1.00							
Sr total	0.90	-0.97	-0.80	-0.54	-0.86	-0.55	0.76	0.01	0.11	0.84	0.44	0.96	-0.79	0.88	-0.81	-0.04	-0.12	0.88	1.00						
Cu WSC**	0.94	-0.96	-0.74	-0.56	-0.73	-0.49	0.66	0.13	-0.36	0.69	-0.03	0.94	-0.61	0.99	-0.45	0.20	-0.33	0.84	0.87	1.00					
Ni WSC	-0.33	0.55	0.30	-0.02	0.45	0.68	-0.77	-0.19	-0.74	-0.44	-0.90	-0.60	0.87	-0.34	0.96	0.65	0.13	-0.77	-0.69	-0.31	1.00				
Pb WSC	0.78	-0.52	-0.93	-0.99	-0.87	0.37	-0.11	-0.75	-0.28	0.88	-0.01	0.43	0.06	0.50	-0.25	0.76	0.58	0.35	0.54	0.55	0.01	1.00			
Cr WSC	0.96	-0.81	-0.98	-0.92	-0.95	-0.01	0.27	-0.45	-0.25	0.94	0.08	0.74	-0.29	0.79	-0.22	0.54	0.26	0.67	0.81	0.82	-0.22	0.92	1.00		
V WSC	0.93	-0.99	-0.75	-0.52	-0.77	-0.57	0.75	0.14	-0.18	0.73	0.14	0.98	-0.73	0.98	-0.60	0.07	-0.31	0.92	0.94	0.98	-0.48	0.51	0.81	1.00	
Sr WSC	0.94	-0.94	-0.75	-0.58	-0.73	-0.46	0.63	0.11	-0.39	0.69	-0.07	0.93	-0.58	0.99	-0.41	0.24	-0.31	0.82	0.85	0.99	-0.27	0.56	0.83	0.97	1.00

*Correlation is calculated for $n = 24$ and $P = 0.95$; **WSC – element concentrations in the soil water-soluble components

Table S3. Correlation coefficients between the contents of the selected trace elements and the concentrations of the different soil organic carbon fractions

	C _{HA1}	C _{HA2}	C _{HA3}	C _{FA1a}	C _{FA1}	C _{FA2}	C _{FA3}	Humin	Cu total	Ni total	Pb total	Cr total	V total	Sr total	Cu WSC	Ni WSC	Pb WSC	Cr WSC	V WSC	Sr WSC
C _{HA1}	1.00																			
C _{HA2}	0.95*	1.00																		
C _{HA3}	0.99	0.98	1.00																	
C _{FA1a}	0.93	0.79	0.90	1.00																
C _{FA1}	0.97	0.87	0.94	0.99	1.00															
C _{FA2}	0.98	0.99	0.99	0.85	0.90	1.00														
C _{FA3}	0.72	0.68	0.78	0.91	0.79	0.76	1.00													
Humin	0.77	0.93	0.88	0.50	0.67	0.92	0.62	1.00												
Cu total	0.90	0.83	0.91	0.99	0.93	0.88	0.95	0.71	1.00											
Ni total	-0.98	-0.53	-0.58	-0.98	-0.74	-0.52	-0.23	-0.22	-0.46	1.00										
Pb total	-0.16	0.45	0.33	-0.49	0.01	0.42	0.17	0.73	0.14	0.43	1.00									
Cr total	0.12	0.19	0.02	-0.22	-0.19	0.09	-0.53	0.32	-0.37	-0.02	0.53	1.00								
V total	0.92	0.74	0.83	0.99	0.97	0.77	0.71	0.48	0.86	-0.84	-0.23	-0.30	1.00							
Sr total	0.98	0.86	0.92	0.98	0.99	0.88	0.71	0.64	0.88	-0.81	-0.04	-0.12	0.88	1.00						
Cu WSC**	0.93	0.85	0.92	0.99	0.92	0.90	0.95	0.75	0.99	-0.45	0.20	-0.33	0.84	0.87	1.00					
Ni WSC	-0.91	-0.31	-0.38	-0.99	-0.62	-0.31	-0.13	0.02	-0.34	0.96	0.65	0.13	-0.77	-0.69	-0.31	1.00				
Pb WSC	0.63	0.87	0.78	-0.99	0.54	0.83	0.36	0.95	0.50	-0.25	0.76	0.58	0.35	0.54	0.55	0.01	1.00			
Cr WSC	0.91	0.99	0.96	0.71	0.82	0.98	0.65	0.96	0.79	-0.22	0.54	0.26	0.67	0.81	0.82	-0.22	0.92	1.00		
V WSC	0.93	0.85	0.93	0.99	0.97	0.90	0.90	0.69	0.98	-0.60	0.07	-0.31	0.92	0.94	0.98	-0.48	0.51	0.81	1.00	
Sr WSC	0.94	0.86	0.92	0.99	0.91	0.90	0.95	0.76	0.99	-0.41	0.24	-0.31	0.82	0.85	0.99	-0.27	0.56	0.83	0.97	1.00

*Correlation is calculated for $n = 24$ and $P = 0.95$; **WSC – element concentrations in the soil water-soluble components