

Investigating the Aging Effects of Biochar on Soil C and Si Dissolution and the Interactive Impact on Copper Immobilization

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Table S1. The properties of the soil and BC.

Parameters	Soil			BC	
	BS	VS	RS	BC300	BC600
pH	6.15	5.88	4.86	7.54	9.53
Soil organic matter (g/kg)	34.2	16.7	9.2	-	-
Cation exchange capacity (cmol/kg)	48.3	20.9	14.2	18.67	26.25
Dissolved organic carbon (mg/kg)	121	199	7.1	738	257
Available silicon (1:25 citric acid, mg/kg)	715	36	105	-	-
SiO ₂ (%)	-	-	-	4.70	8.54
Ash (%)	-	-	-	4.88	9.50
S _{BET} (m ² /g)	-	-	-	69.62	183.15
PZC	-	-	-	4.06	5.10
Metal content (mg/kg) Cu	61.1	19.0	8.12	2.12	3.78
Pb	8.13	16.1	7.78	-	-
Cd	< 0.1	< 0.1	< 0.1	-	-
Zn	83.2	45.1	16.7	-	-

BS, black soil. VS, Vegetable garden soil. RS, red soil.

Table S2. Elemental compositions and atomic ratios of biochars.

Biochar	C/%	H/%	O/%	N/%	H/C	O/C	(O+N)/C
BC300	57.13	3.95	22.36	2.46	0.07	0.39	0.43
BC600	74.57	1.51	13.91	3.19	0.02	0.19	0.23

Table S3. Extractants used in sequential extraction of metal in soil.

	Phase	Reagent	Time of shaking
Fraction 1 (F1)	Easily exchangeable	1M MgCl ₂ (pH 7)	1 h at 25°C
Fraction 2 (F2)	Bound to carbonates	1M CH ₃ COONa/CH ₃ COOH (pH 5)	5 h at 25°C
Fraction 3 (F3)	Bound to Fe and Mn oxide	0.04 M NH ₂ OH·HCl in 25%(v/v)CH ₃ COOH(pH 2)	6 h at 96°C
Fraction 4 (F4)	Bound to organic	30% H ₂ O ₂ /0.02 MHNO ₃ (pH 2), followed by 3.2M CH ₃ COONH ₄ /20%(v/v) HNO ₃	2 h at 85°C/3 h at 85°C
Fraction 5 (F5)	Residual	HNO ₃ /HCl/HClO ₄	Digestion

Table S4. Comparison of sorption capacity of Cu with biochars derived from different materials.

Heavy metal	Biochar reparation source	Maximal adsorption capacity (mg/g)	Literature resources
Cu	Hardwood	6.79	Chen et al.(2008)
	Cron straw	12.52	Chen et al. (2011)
	Interweed	48.49	Li et al. (2013).
	Miscanthus	15.4	SHIM et al.(2015)
	Cow dung	54.4	Xu et al. (2013)
	Pig manure	88.23	Kolodynska et al.(2012)
	sludge	14.83	Jin et al.(2016)
	Pine	1.47	Jiang et al.(2016)
	Hickory wood	12.30	Wang et al.(2015)
	Apple tree branch	15.85	Wang et al.(2017)
	Sycamore wood	17.44	Wang et al.(2017)

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Table S5. Effects of the application of BC on an increase/decrease in silicon content/ DOC content in soil.

	Time	BS		VS		RS	
		BC300	BC600	BC300	BC600	BC300	BC600
E _{BC} -DOC	1 d	48%	20%	39%	11%	634%	301%
	3 d	27%	-1%	39%	18%	797%	256%
	5 d	19%	-2%	49%	24%	839%	225%
	7 d	6%	-11%	36%	28%	613%	165%
	14 d	20%	-6%	42%	32%	678%	292%
	21 d	16%	-8%	62%	40%	938%	204%
	28 d	13%	-5%	65%	45%	629%	122%
	60 d	20%	4%	46%	32%	590%	121%
	180 d	14%	2%	48%	25%	475%	127%
	1 a	20%	7%	23%	15%	513%	139%
E _{BC} -Available Si	1 d	-10%	1%	-30%	228%	-16%	94%
	3 d	-9%	2%	-42%	108%	-6%	81%
	5 d	-8%	1%	-30%	149%	-13%	73%
	7 d	-7%	-3%	-30%	87%	-20%	53%
	14 d	-11%	-4%	-13%	136%	-18%	49%
	21 d	-14%	-6%	-9%	190%	-25%	48%
	28 d	-13%	-1%	-15%	123%	-35%	46%
	60 d	-13%	2%	-17%	225%	-35%	46%
	180 d	-10%	3%	-31%	174%	-13%	52%
	1 a	-11%	1%	-13%	199%	-13%	66%

BS, black soil.VS, Vegetable garden soil. RS,red soil; E_{BC}-DOC, The percent increase or decrease in DOC content in soil under amendment with BC; E_{BC}-Available Si, The percent increase or decrease in available Si content in soil under amendment with BC

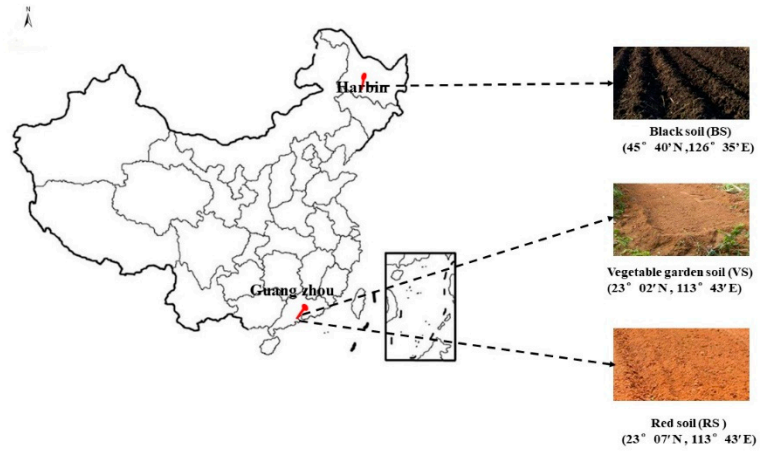


Figure S1. The locations of the soil sampling sites.