

Article

Plant Growth and Nutrient Composition of Shrub and Arbor Willows Grown in Cu-Contaminated Flooded Soil

Table S1. Physical and chemical characteristics of the selected soil.

Soil Parameters	Measured Value
pH	6.9 ± 0.03
Organic matter (g.kg ⁻¹)	2.8 ± 0.1
Total nitrogen (g.kg ⁻¹)	1.3 ± 0.02
Total phosphorus (g.kg ⁻¹)	1.2 ± 0.09
Total potassium (g.kg ⁻¹)	26.1 ± 1.1
Total copper (mg.kg ⁻¹)	239.5 ± 33.7
Available copper (mg.kg ⁻¹)	43.3 ± 1.6

Table S2. The recovery data for the elemental analysis using inductively coupled plasma atomic emission spectrometry (ICP-AES).

	CRM	Cu	Mn	Fe	Mg (%)	P (%)	K (%)	S (%)	Ca (%)
GB-07604	Certified values	6.6 ± 1.0	61 ± 4	1070 ± 0.17	0.48 ± 0.03	0.1 ± 0.06	0.92 ± 0.07	0.73 ± 0.04	1.60 ± 0.12
	Measured value	6.4 ± 0.2	57 ± 2	983 ± 13	0.44 ± 0.02	0.1 ± 0.04	0.92 ± 0.06	0.71 ± 0.02	1.68 ± 0.08
	Recovery rate (%)	96 ± 2.5	92 ± 1.5	103 ± 6.1	92 ± 0.01	103 ± 0.01	100 ± 0.04	97 ± 0.02	95 ± 0.43

Table S3. Correlations between DCB-Cu, DCB-Fe, DCB-Mn, and DCB-S.

	Cu	Fe	Mn	S
Cu	1			
Fe	-0.97 **	1		
Mn	-0.98 **	0.94 **	1	
S	0.74 **	-0.75 **	-0.69 **	1

p values of the Pearson correlation analysis were also shown. * *p* < 0.05, ** *p* < 0.01.

Table S4. Macroelements (K, Ca, Mg, S g.kg⁻¹) in the dry weight plant tissues of *S.integra* ‘Yizhibi’ and *S.jiangsuensis* ‘J172’ exposed to Cu-contaminated soil as affected by soil flooding for 90 d.

Elements	Plant Species	Plant Tissues							
		Leaf	Stem		Cutting		Root		
		Non-Flooded Flooding	Non-Flooded Flooding	Non-Flooded Flooding	Non-Flooded Flooding	Non-Flooded Flooding	Non-Flooded Flooding	Non-Flooded Flooding	
K	<i>S.integra</i> ‘Yizhibi’	14.2 ± 0.12c	16.7 ± 0.58a	3.9 ± 0.06b	3.0 ± 0.28c	3.7 ± 0.15b	3.3 ± 0.07c	7.4 ± 0.29c	8.4 ± 0.24b
	<i>S.jiangsuensis</i> ‘J172’	15.3 ± 0.12b	11.1 ± 0.02d	4.8 ± 0.23a	3.9 ± 0.11b	4.4 ± 0.07a	3.8 ± 0.11b	8.1 ± 0.08b	11.9 ± 0.30a
Ca	<i>S.integra</i> ‘Yizhibi’	43.9 ± 0.71a	35.4 ± 1.5b	11.2 ± 0.13a	8.0 ± 0.77b	7.7 ± 0.21a	6.0 ± 0.15c	6.1 ± 0.11c	7.3 ± 0.11a
	<i>S.jiangsuensis</i> ‘J172’	28.1 ± 0.31c	26.3 ± 0.12d	6.8 ± 0.31c	5.6 ± 0.24d	6.8 ± 0.12b	4.9 ± 0.21d	6.4 ± 0.11b	6.4 ± 0.14b
Mg	<i>S.integra</i> ‘Yizhibi’	1.5 ± 0.02b	1.5 ± 0.06b	0.28 ± 0.00b	0.24 ± 0.02c	0.30 ± 0.01c	0.26 ± 0.01d	0.82 ± 0.03c	0.9 ± 0.02b
	<i>S.jiangsuensis</i> ‘J172’	1.8 ± 0.04a	1.8 ± 0.01a	0.37 ± 0.01a	0.36 ± 0.01a	0.38 ± 0.01a	0.35 ± 0.00b	0.94 ± 0.02b	1.2 ± 0.02a
S	<i>S.integra</i> ‘Yizhibi’	14.8 ± 0.22a	13.1 ± 0.53b	0.66 ± 0.01a	0.58 ± 0.05b	0.82 ± 0.03a	0.56 ± 0.01d	2.3 ± 0.06d	2.9 ± 0.10b
	<i>S.jiangsuensis</i> ‘J172’	10.3 ± 0.16d	11.6 ± 0.09c	0.47 ± 0.03c	0.47 ± 0.02c	0.67 ± 0.02c	0.74 ± 0.01b	2.8 ± 0.02c	4.7 ± 0.10a

Each value represents the mean of three replicates ± standard deviation. Different letters indicate significantly different values among the treatments and between the species (*p* < 0.05).

Table S5. Eigenvalues and variance of Principal Component Analysis for elements.

Elements:Cu	Eigenvalues	Variance (%)	Cumulative (%)	PC1	PC2
Fe:Cu	8.072	89.687	89.687	0.217	−0.870
Mn:Cu	0.784	8.714	98.401	0.337	−0.214
K:Cu	0.101	1.119	99.521	0.350	0.111
Ca:Cu	0.030	0.329	99.850	0.349	0.137
S:Cu	0.008	0.094	99.945	0.346	−0.123
Mg:Cu	0.003	0.035	99.980	0.350	−0.003
C:Cu	0.001	0.013	99.992	0.337	0.279
N:Cu	4.937E-4	0.005	99.998	0.349	0.126
P:Cu	1.905E-4	0.002	100.000	0.342	0.239

Table S6. Summary of the two-way ANOVA for C, N, and P and their corresponding stoichiometric ratios in different plant tissues as affected by species and flooding.

Variable	Species		Treatment		Species × Treatment	
	F-Value	p-Value	F-Value	p-Value	F-Value	p-Value
Leaf C concentrations	2.82	>0.05	0.79	>0.05	0.37	>0.05
Stem C concentrations	9.04	0.0200	4.94	>0.05	2.12	>0.05
Cutting C concentrations	1.46	>0.05	4.98	>0.05	0.01	>0.05
Root C concentrations	0.43	>0.05	1.80	>0.05	0.02	>0.05
Leaf N concentrations	261.50	0.0393	12.35	>0.05	2.34	>0.05
Stem N concentrations	323.65	0.0354	7.28	>0.05	0.16	>0.05
Cutting N concentrations	191.21	0.0001	33.28	0.0004	122.78	0.0001
Root N concentrations	26.37	0.0009	33.47	0.0004	65.40	0.0001
Leaf P concentrations	46.57	0.0001	648.69	0.0001	25.95	0.0009
Stem P concentrations	81.33	0.0001	93.76	0.0001	1.26	>0.05
Cutting P concentrations	0.14	>0.05	9.51	0.0150	13.97	0.0057
Root P concentrations	69.35	>0.05	163.70	>0.05	44.90	0.0002
Leaf C:N ratio	153.37	0.0001	1.73	>0.05	0.71	>0.05
Stem C:N ratio	32.70	0.0004	0.004	>0.05	0.024	>0.05
Cutting C:N ratio	69.33	0.0001	35.57	0.0003	58.27	0.0001
Root C:N ratio	5.87	0.0417	9.88	0.0137	7.88	0.0230
Leaf C:P ratio	29.57	0.0006	385.72	0.0001	5.10	>0.05
Stem C:P ratio	58.20	0.0001	62.94	0.0001	0.31	>0.05
Cutting C:P ratio	0.01	>0.05	1.99	>0.05	7.76	0.0237
Root C:P ratio	26.69	0.0009	53.29	0.0001	10.79	0.0111
Leaf N:P ratio	111.29	0.0001	1304.85	0.0001	51.25	0.0001
Stem N:P ratio	361.84	0.0001	168.72	0.0001	3.95	>0.05
Cutting N:P ratio	18.79	0.0025	17.56	0.0030	47.89	0.0001
Root N:P ratio	28.67	0.0007	246.16	0.0001	3.04	>0.05

Table S7. Summary of the two-way ANOVA for element:Cu ratios in different plant tissues as affected by species and flooding.

Variable	Species		Treatment		Species × Treatment	
	F-Value	p-Value	F-Value	p-Value	F-Value	p-Value
Leaf C:Cu ratio	170	0.0001	4376	0.0001	628	0.0001
Stem C:Cu ratio	41,359	0.0001	615	0.0001	8591	0.0001
Cutting C:Cu ratio	16,556	0.0001	2557	0.0001	307	0.0001
Root C:Cu ratio	6762	0.0001	3234	0.0001	1989	0.0001
Leaf N:Cu ratio	205	0.0001	4072	0.0001	962	0.0001
Stem N:Cu ratio	3429	0.0001	1.19	>0.05	714	0.0001
Cutting N:Cu ratio	5226	0.0001	228	0.0001	369	0.0001
Root N:Cu ratio	8133	0.0001	3844	0.0001	2162	0.0001
Leaf P:Cu ratio	251	0.0001	1319	0.0001	175	0.0001
Stem P:Cu ratio	1065	0.0001	167	0.0001	346	0.0001
Cutting P:Cu ratio	931	0.0001	159	0.0001	0.05	>0.05
Root P:Cu ratio	4001	0.0001	888	0.0001	580	0.0001
Leaf K:Cu ratio	147	0.0001	5663	0.0001	3367	0.0001
Stem K:Cu ratio	1265	0.0001	337	0.0001	179	0.0001
Cutting K:Cu ratio	1857	0.0001	964	0.0001	40	0.0002
Root K:Cu ratio	9127	0.0001	4769	0.0001	2927	0.0001
Leaf Ca:Cu ratio	53	0.0001	2511	0.0001	596	0.0001
Stem Ca:Cu ratio	1292	0.0001	34	0.0004	376	0.0001
Cutting Ca:Cu ratio	806	0.0001	72	0.0001	9.94	0.0135
Root Ca:Cu ratio	4966	0.0001	1891	0.0001	1055	0.0001
Leaf Mg:Cu ratio	108	0.0001	4307	0.0001	322	0.0001
Stem Mg:Cu ratio	659	0.0001	191	0.0001	106	0.0001
Cutting Mg:Cu ratio	820	0.0001	855	0.0001	66	0.0001
Root Mg:Cu ratio	14,697	0.0001	8312	0.0001	4241	0.0001
Leaf S:Cu ratio	286	0.0001	3144	0.0001	363	0.0001
Stem S:Cu ratio	875	0.0001	13	0.0070	186	0.0001
Cutting S:Cu ratio	1302	0.0001	481	0.0001	545	0.0001
Root S:Cu ratio	8841	0.0001	4555	0.0001	2404	0.0001
Leaf Fe:Cu ratio	152	0.0001	135	0.0001	18	0.0027
Stem Fe:Cu ratio	465	0.0001	8.92	0.0174	22	0.0015
Cutting Fe:Cu ratio	5332	0.0001	544	0.0001	71	0.0001
Root Fe:Cu ratio	29,217	0.0001	4872	0.0001	1826	0.0001
Leaf Mn:Cu ratio	79	0.0001	3107	0.0001	296	0.0001
Stem Mn:Cu ratio	445	0.0001	58	0.0001	329	0.0001
Cutting Mn:Cu ratio	2458	0.0001	308	0.0001	96	0.0001
Root Mn:Cu ratio	29,431	0.0001	3111	0.0001	758	0.0001