Supplementary Materials

Uptake of Thallium(I) by Rice Seedlings Grown in Different Soils: Key Soil Properties Determining Soil Thallium Availability

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Analysis of clay mineral composition of the tested soils

To determine the clay mineralogical composition, particle size fractionation was conducted for the tested soils after the removals of soluble salts, carbonates, organic matter, iron oxides and amorphous aluminosilicate materials, following the procedures described in Soukup et al. [1]. The clay suspensions were flocculated, sonicated and then used to prepare oriented clay deposits after treatment with 1 N $MgCl_2$ or KCl [2]. Mg-saturated deposits were treated with and without glycerol solvation, and K-saturated deposits were heated for 4 h at 110, 350, and 550 °C in an oven. The clay minerals in the soils were identified using an X-ray diffractometer (XRD) (Rigaku MiniFlex) with Cu-$K\alpha$ radiation (λ = 1.5419 Å) by scanning at 2θ°angles from 3° to 50°. The changes in the basal reflections in the XRD patterns under different treatments were used to distinguish the swelling and non-swelling interlayers in the 2:1 clay minerals, as well as kaolinite. The semi-quantitation was measured by the areas of the corresponding basal reflections [3].

References:

1. Soukup, D.A.; Buck, B.J.; Lynn, W.C. Preparing soils for mineralogical analyses. In Methods of Soil Analysis Part 5 - Mineralogical Analysis; Ulery, A.L., Drees, L.R., Eds.; Soil Science Society of America: Madison, WI, USA, 2008, pp. 13-31.
2. Harris, W.; White, G.N. X-ray diffraction techniques for soil mineral identification. In Methods of Soil Analysis Part 5 - Mineralogical Methods; Ulery, A.L., Drees, L.R., Eds.; Soil Science Society of America: Madison, Wisconsin, USA, 2008, pp. 81-115.
3. Johns, W.D.; Grim, R.E.; Bradley, W.F. Quantitative estimations of clay minerals by diffraction methods. Journal of Sedimentary Petrology **1954**, 24, 242-251.

Table S1. The chemical composition of modified half-strength Kimura nutrient solution.

Stock solution	Composition	Concentration	Final concentration in nutrient solution[1]
A	$(NH_4)_2SO_4$	0.18 M	0.18 mM
	KNO_3	0.09 M	0.09 mM
	$MgSO_4·7H_2O$	0.27 M	0.27 mM
	KH_2PO_4	0.09 M	0.09 mM
B	Fe(III) citrate	30.6 mM	30.6 µM
	$Ca(NO_3)_2·4H_2O$	183 mM	183 µM
	HCl	0.5 M	0.5 mM
C	H_3BO_3	2.51 mM	2.51 µM
	$MnSO_4·H_2O$	0.201 mM	0.201 µM
	$ZnSO_4·7H_2O$	0.201 mM	0.201 µM
	$CuSO_4·5H_2O$	0.052 mM	0.052 µM
	H_2MoO_4	0.049 mM	0.049 µM

[1] The pH of the nutrient solution was adjusted to 4.8 using 1 M HCl and NaOH solutions.

Table S2. Clay mineral compositions of the tested soils.

Clay mineral \ Soil	Pc	Tn	Pu	Hm	Ks	Lu	Fl
Kaolinite	+++	+++	++++	+++	+++	+++	+++
Illite	+++	++	++	++	-	+++	++++
Chlorite	-	+	+	+	++	+	+
Smectite	-	-	-	+	-	-	+
Vermiculite	+	+++	-	+++	+	+	+
Hydroxy-interlayered vermiculite	++	++	++	++	+++	+	+
Interstratified illite-chlorite	+	-	+	-	+	-	+

Non-detectable (-), < 10% (+), 10-25% (++), 25-50% (+++) and > 50% (++++)

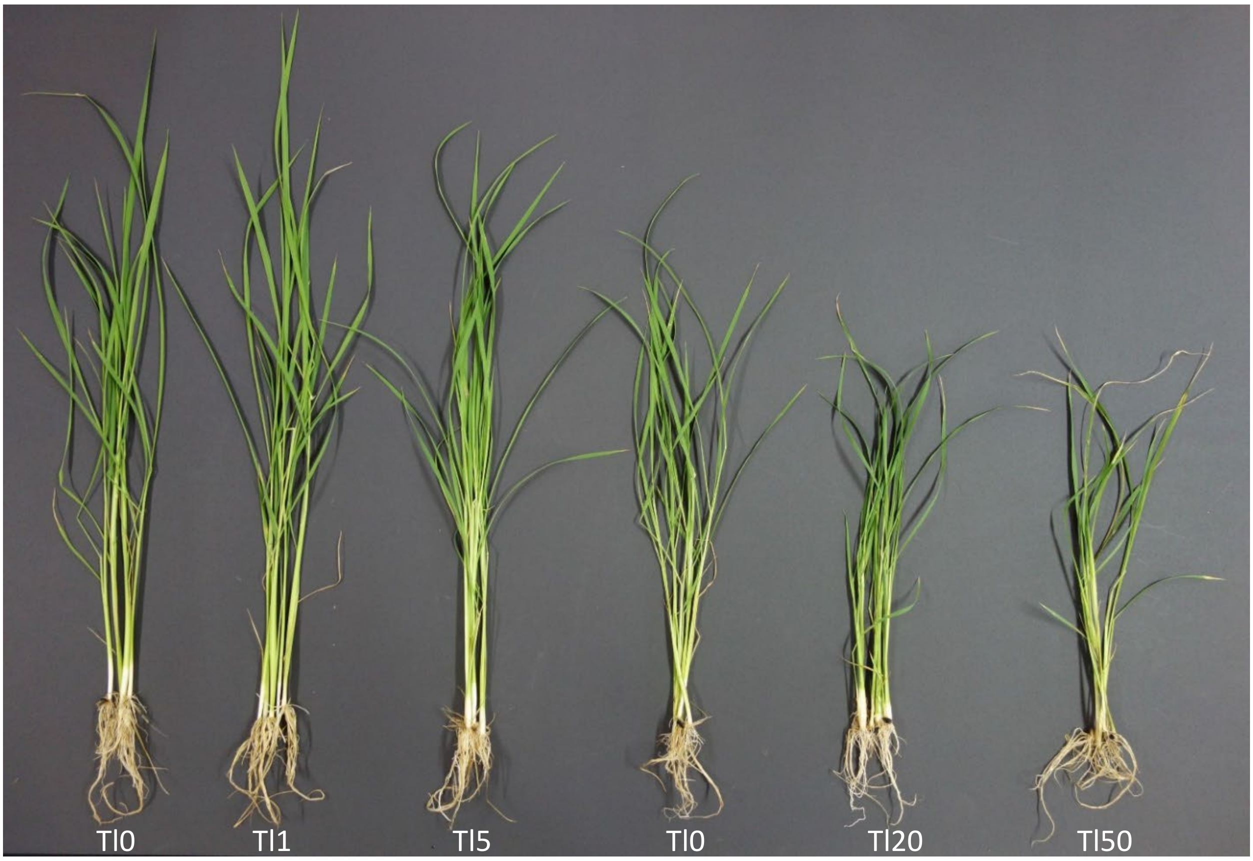

Figure S1. The toxic symptoms of rice seedlings as a function of soil Tl concentration.