

Supplementary Information

Mutual effects and *in-planta* speciation of cerium oxide nanoparticles and cadmium in hydroponically grown soybean (*Glycine max* (L.) Merr.)

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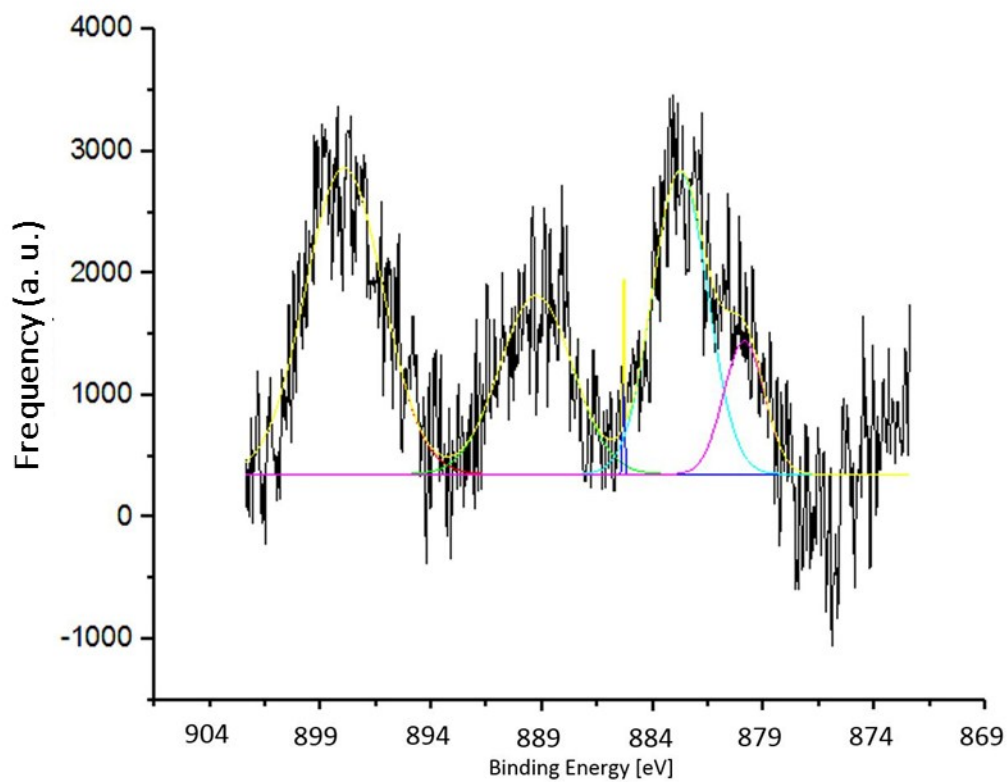
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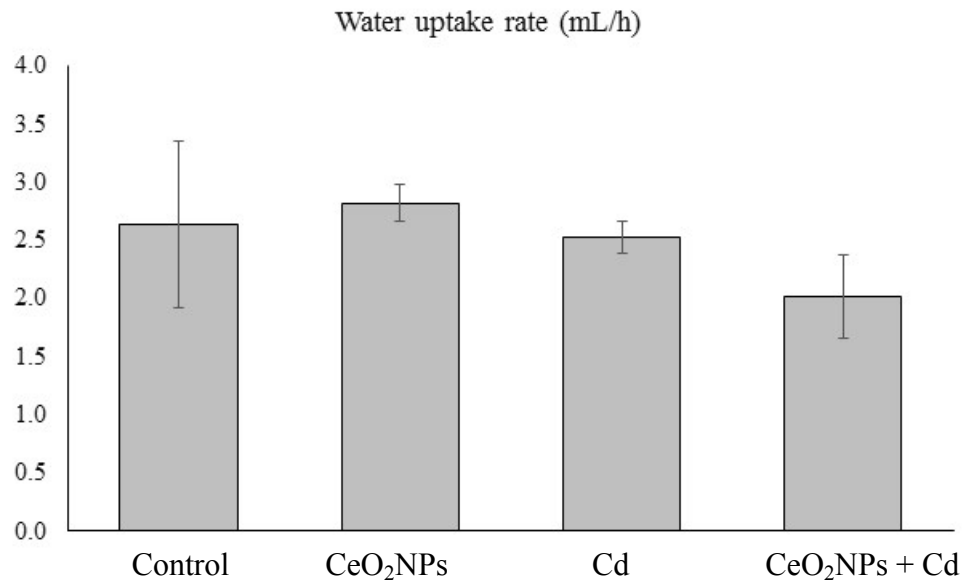
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Table S1 –*p* values from Two-way ANOVA analysis

Two-way ANOVA		<i>p</i>
Root DW (g)	CeO ₂ NPs	0.393
	Cd	0.861
	CeO ₂ NPs × Cd	0.326
Shoot DW (g)	CeO ₂ NPs	0.002
	Cd	0.008
	CeO ₂ NPs × Cd	0.064
Root Ce (mg/kg)	CeO ₂ NPs	<0.001
	Cd	0.003
	CeO ₂ NPs × Cd	0.003
Shoot Ce (mg/kg)	CeO ₂ NPs	<0.001
	Cd	<0.001
	CeO ₂ NPs × Cd	<0.001
Root Cd (mg/kg)	CeO ₂ NPs	0.742
	Cd	<0.001
	CeO ₂ NPs × Cd	0.716
Shoot Cd (mg/kg)	CeO ₂ NPs	<0.001
	Cd	<0.001
	CeO ₂ NPs × Cd	<0.001
Ce ions (mg/kg)	CeO ₂ NPs	<0.001
	Cd	0.035
	CeO ₂ NPs × Cd	0.029
Other forms of Ce (mg/kg)	CeO ₂ NPs	<0.001
	Cd	0.004
	CeO ₂ NPs × Cd	0.003
Total Ce growth medium (μg/L)	CeO ₂ NPs	<0.001
	Cd	0.359
	CeO ₂ NPs × Cd	0.357
Total Ce washing solution (μg/L)	CeO ₂ NPs	<0.001
	Cd	0.122
	CeO ₂ NPs × Cd	0.125
TOC (g/L)	CeO ₂ NPs	0.114
	Cd	0.017
	CeO ₂ NPs × Cd	0.147



Suppl. Fig. 1: Analytical XPS spectrum for five fitting peaks of CeO_2 generated by Gaussian function of Origin Software 2017. The horizontal axis is the associated binding energy [eV] and the arbitrary unit represents the frequency of the peaks. The CeO_2 spectrum analysis yielded a ratio of Ce^{4+} : Ce^{3+} of 90%:10%.



Suppl. Fig. 2 – Water uptake of *Glycine max* grown in the presence of 100 mg L⁻¹ CeO₂NPs and 1 mg L⁻¹ Cd. No statistically significant differences were found by Games-Howell's non parametric post-hoc test ($p < 0.05$). Error bars represent the standard deviation (n=3).