

Supplementary Information

Chlorophyll fluorescence and spectral reflectance parameters

Table 1S. List of parameters derived from the OJIP analysis (Strasser *et al.*, 2004):

Parameter	Meaning
Φ_{P0}	maximum quantum yield of primary photochemistry
Ψ_0	probability that a trapped exciton moves an electron into the electron transport chain further than Q_A^-
Φ_{E0}	the maximum yield of electron transport
Φ_{D0}	fraction of dissipated energy
Φ_{Pav}	average efficiency of electron transport
PI_{ABS}	performance index on absorbed energy
F_v/F_0	maximum efficiency of water splitting complex
ABS/RC	absorbed energy per reaction centre
TR_0/RC	energy trapping per reaction centre
ET_0/RC	electron transport beyond Q_A per reaction centre
DI_0/RC	energy dissipation per reaction centre

Quantitative analysis of Cadmium (Cd^{2+}) ions content in Tomato plant

Table 2S. Preparation steps of plant samples through microwave digestion.

Digestion steps		Temperature (°C)	Time (min)	Power
Step 1	Heating	220	10.0	99 %
	Cooling	20.0	10.0	40 %
	Heating	220	10.0	99 %
Step 2	Heating	160.0	10.0	80 %
	Heating	220.0	10.0	99 %
	Cooling	20.0	10.0	40 %

Table 3S. Analytical parameters for voltammetric determination of Cd²⁺ ions using SWASV method.

Parameters	SWASV
Repeatability (n=5)	0.17 %
Reproducibility (n=3)	0.40 %
Limit of detection (3σ)	0.02 ppb
Limit of quantification (10σ)	0.08 ppb
Amount of spike	30.00 ppb
Amount of Cd found in the spiked sample	29.92 ppb
Recovery rate	99.7 %
Absolute error	0.08 ppb
Relative standard error	0.26 %
Calibration equation	$I(\text{nA}) = 7.1321([\text{Cd}]/\text{ppb}) + 0.5933$ ($R^2 = 0.9997$)
Sensitivity (slope)	7.1321 nA/ppb
Dynamic range	5.00-50.0 ppb

SWASVs analysis of standard and plant samples

The linearity of concentration dependence of the anodic peak current versus various concentrations of Cd²⁺ ions was revealed in Fig. S1. The corresponding standard addition calibration curves and equations employed for the quantitative determination of Cd²⁺ ions concentrations of each plant sample are provided in Fig. S2.

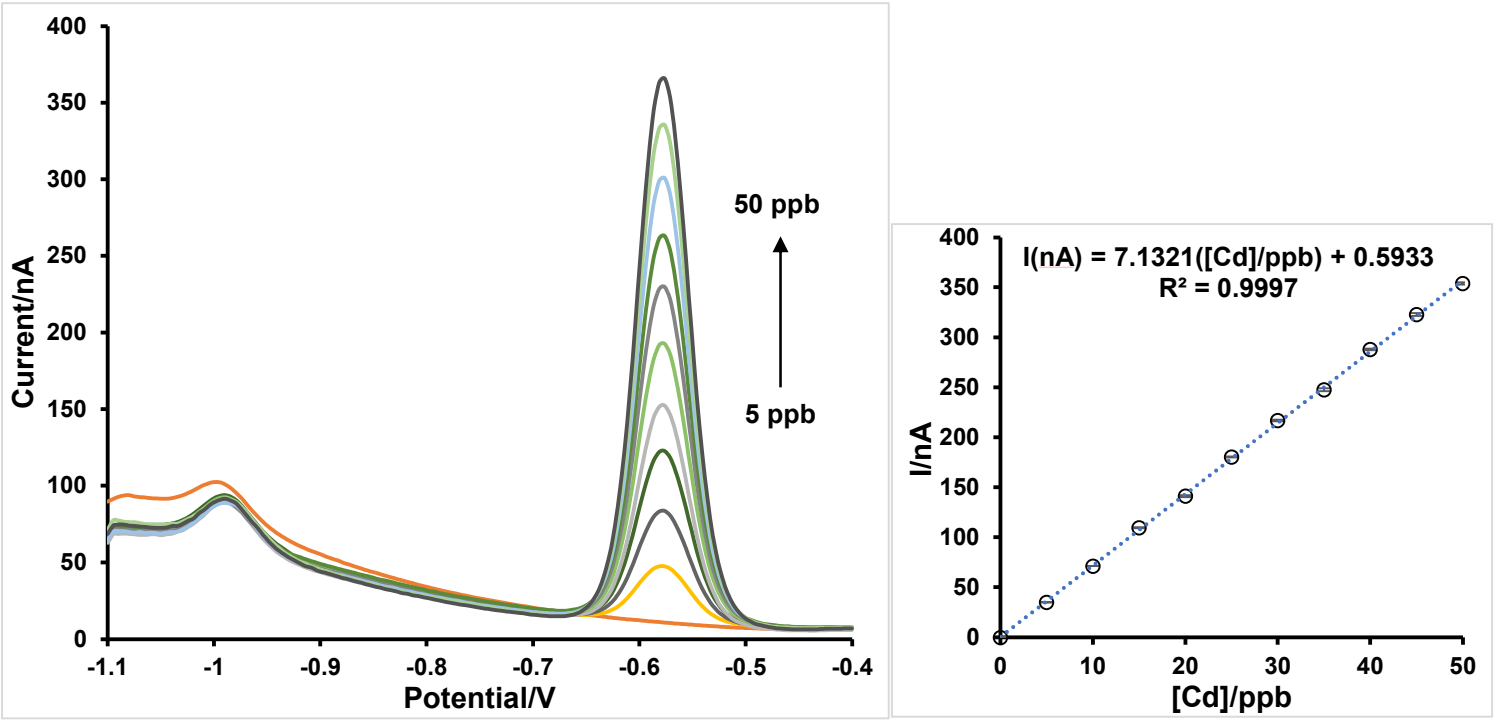
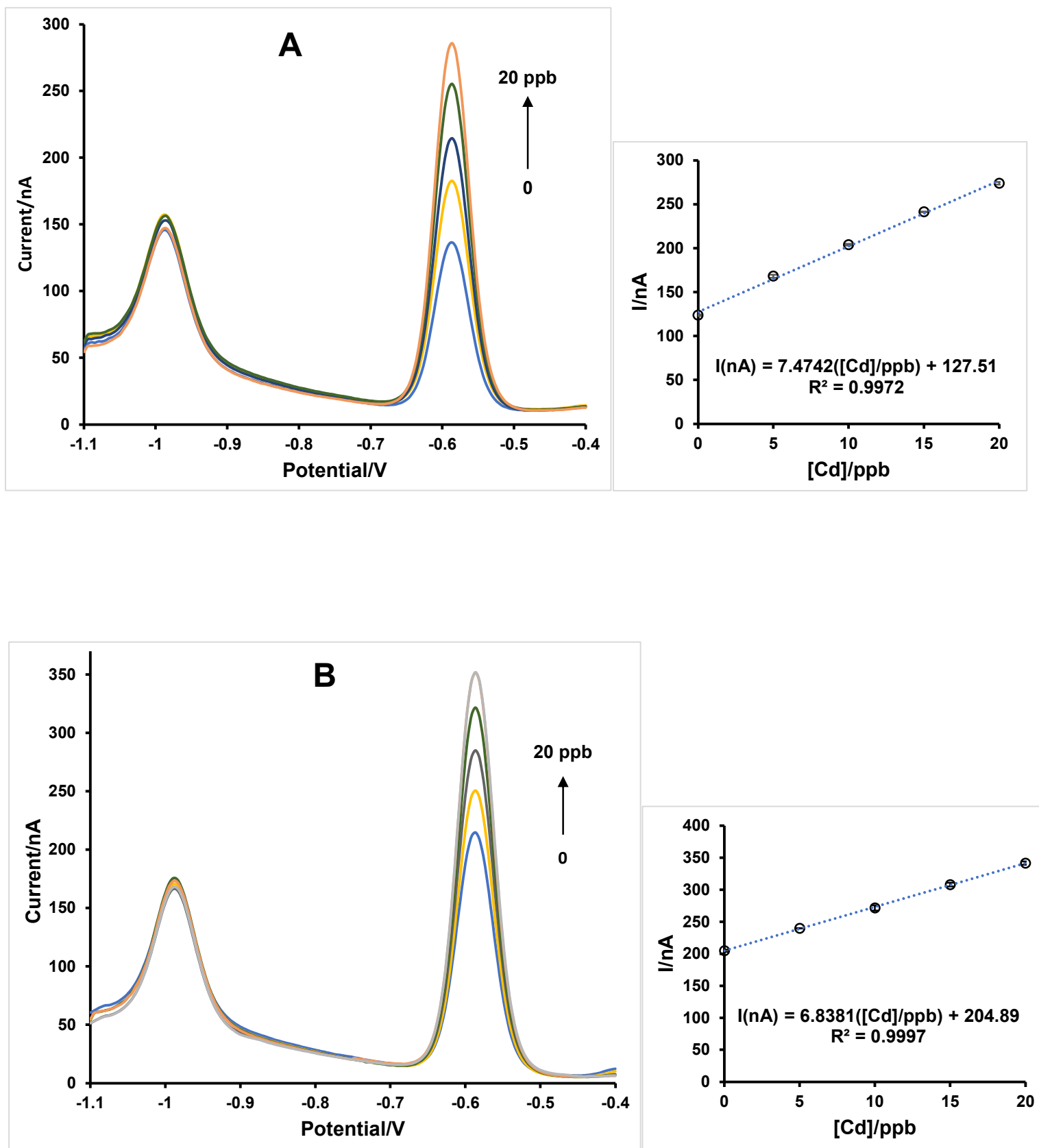
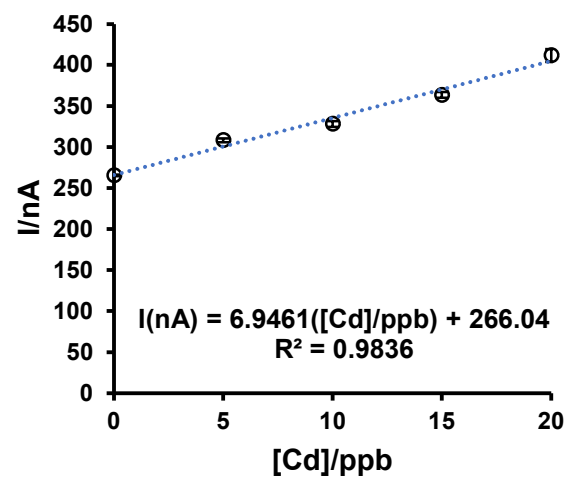
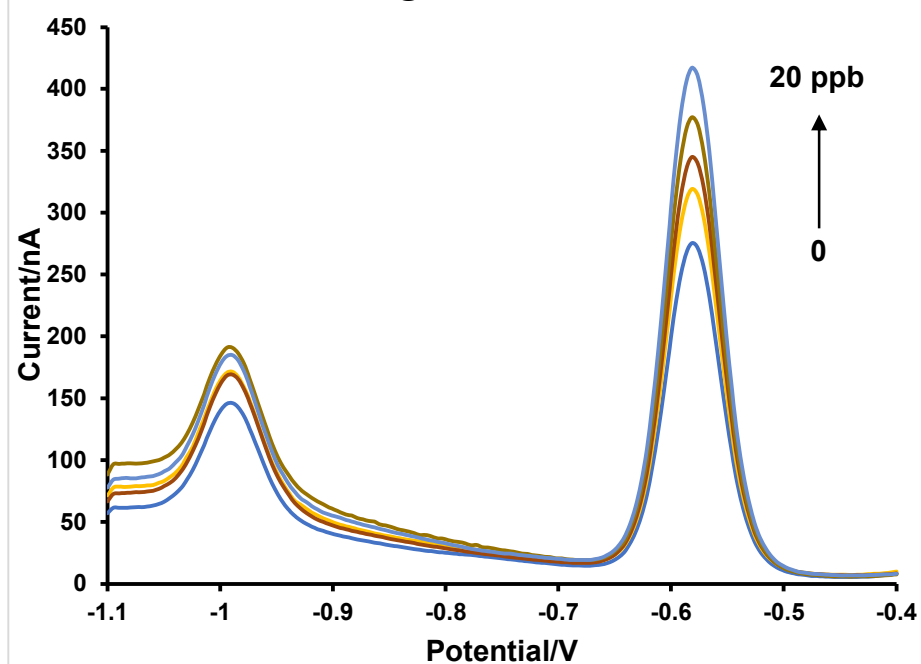
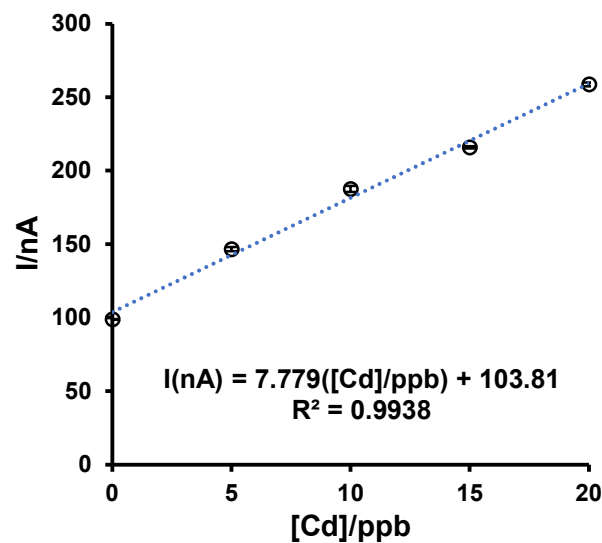
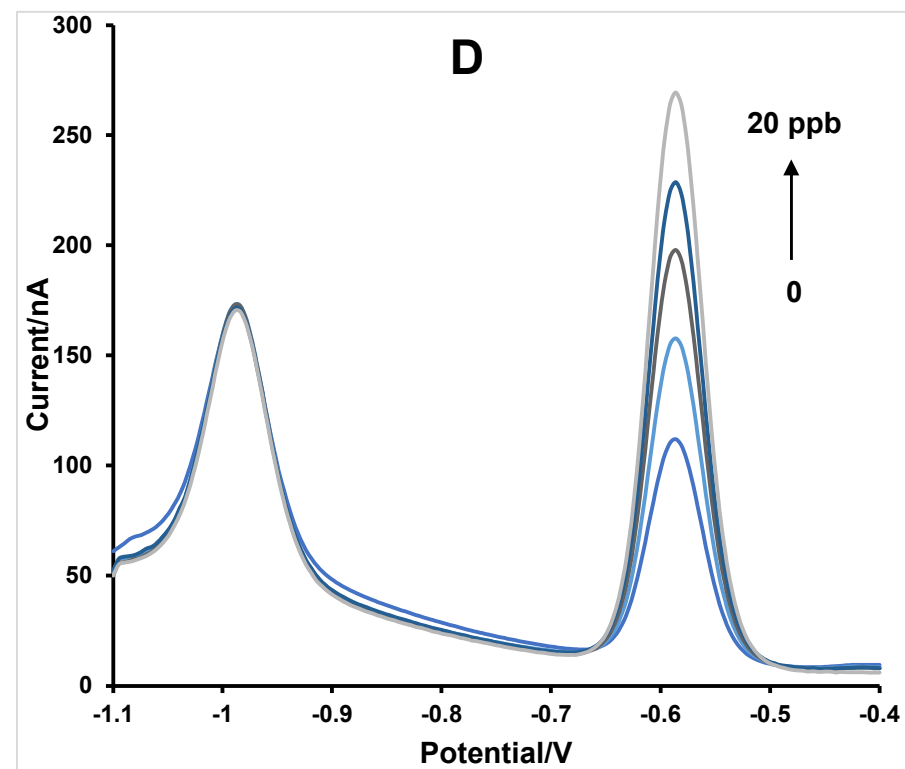


Fig. 1S. The recorded SWASVs for different concentration of Cd²⁺ ions and related concentration dependence of the anodic peak current for Cd²⁺ ions at different concentrations (5.00-50.0 ppb); 0.2 M acetate buffer pH 4.5, E_{acc} = -1.1 V, t_{acc} = 120 s, t_e

Fig. 2S. Standard addition graphs, the recorded SWASVs for various added concentrations of Cd²⁺ ions from (0 to 20 ppb) for each plant samples and related concentration dependence of the anodic peak current versus the added concentration of Cd²⁺ (0.-20 ppb) 0.2 M acetate buffer pH 4.5, E_{acc} = -1.1 V, t_{acc} = 120 s, t_{equilibrium} = 5 s, frequency = 25 Hz. (A): Cd-only treatment, leaf; (B): Cd-only treatment, stem; (C): Cd-only treatment, root; (D): Combined treatment, leaf; (E): Combined treatment, stem; (F): Combined treatment, root. Each measurement repeated 3 times.



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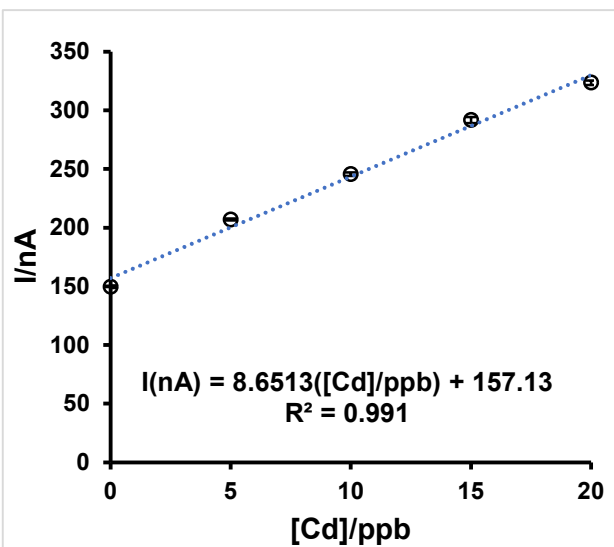
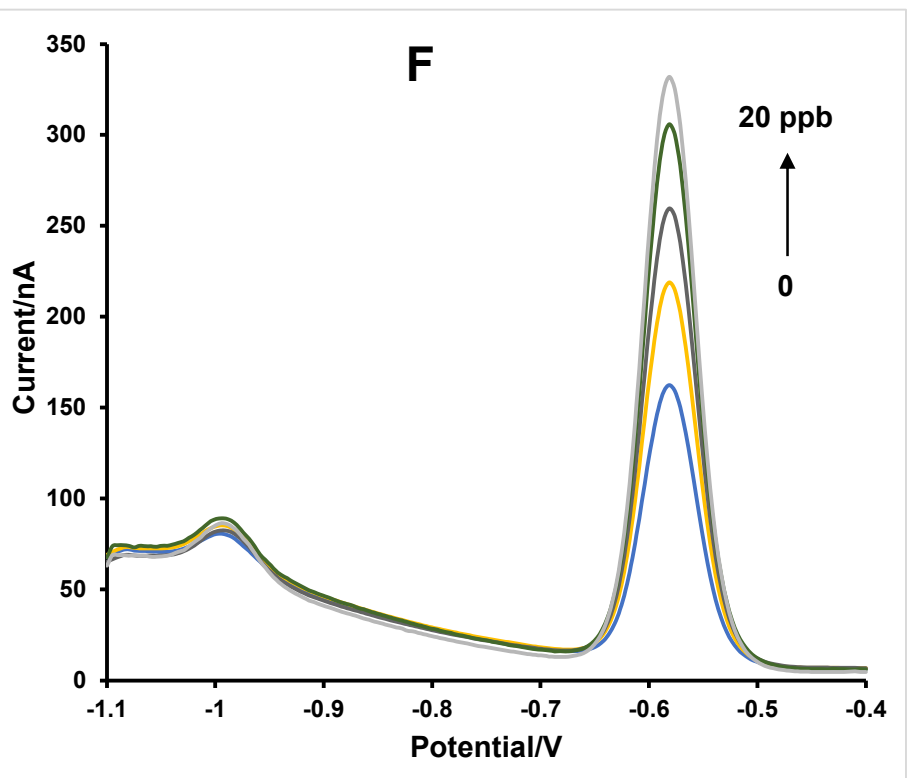
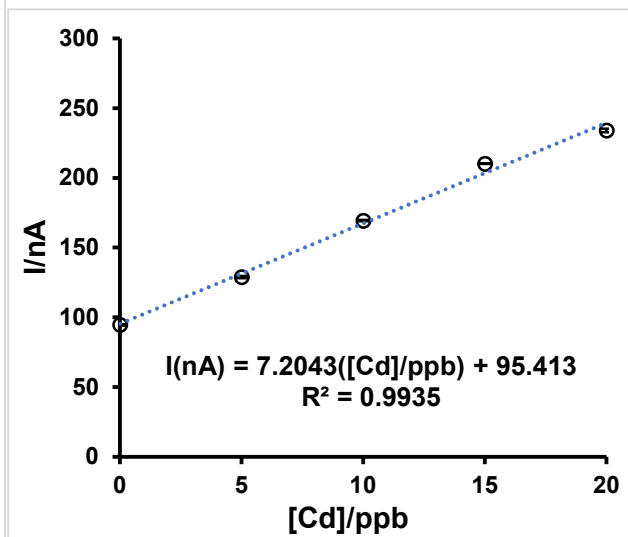
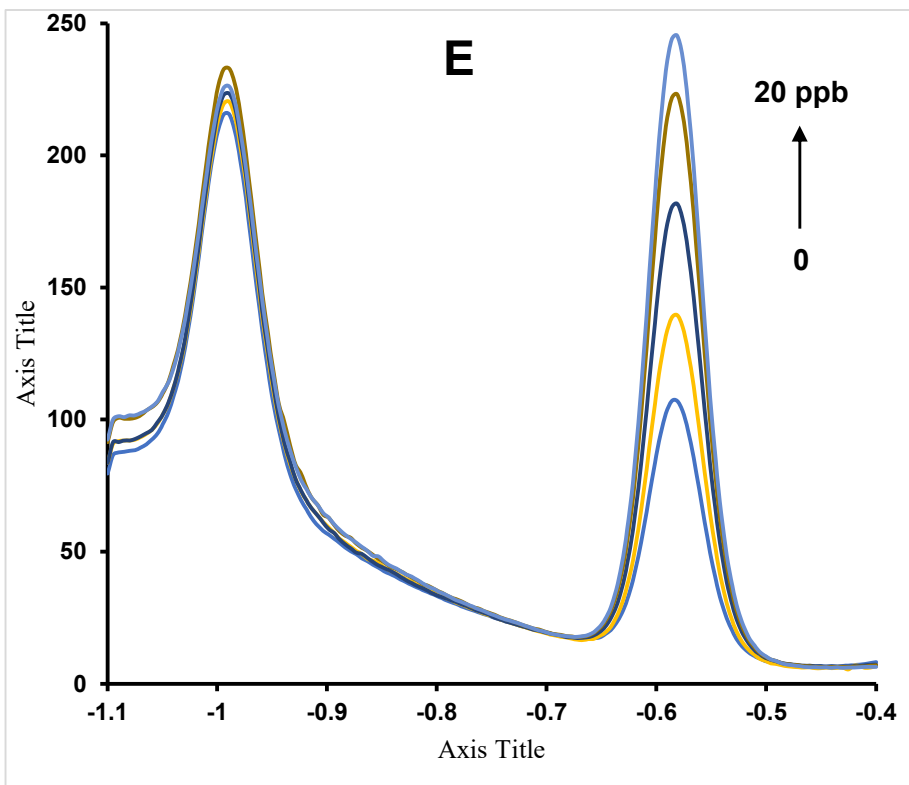


Fig. 3S: Double normalized curves of K-band (A) that display the changes in O–J phase relative variable fluorescence intensity of treatments compared with the control; L-band (B) that shows the changes in O–K phase relative variable fluorescence intensity of treatments compared with the control. Treatments displayed in the legend are Control (Cont), ammonium sulfate addition (AS), cadmium addition (Cd) and combined treatment (AS+Cd).

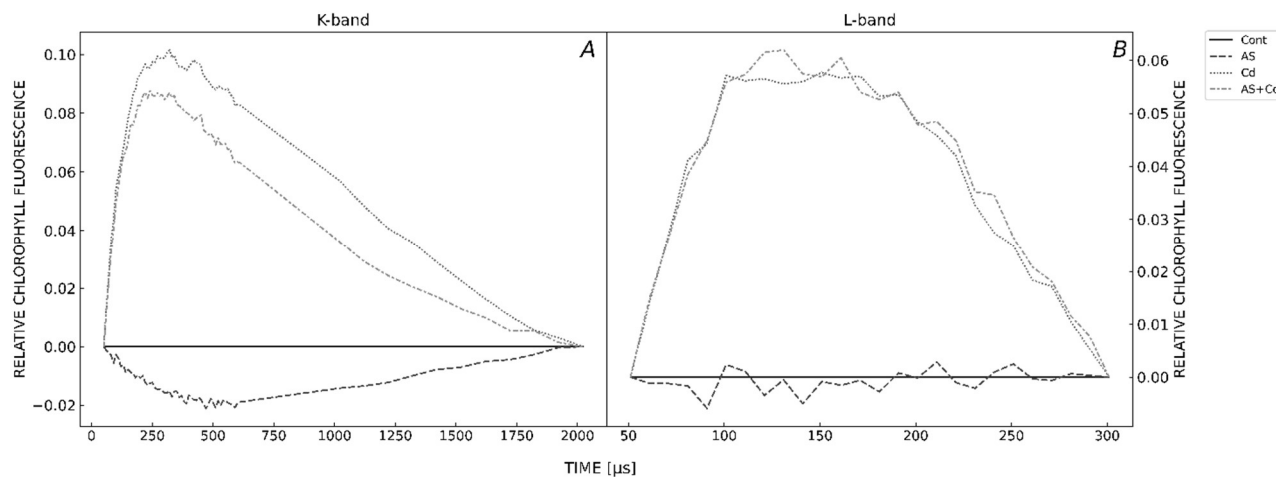


Fig. 4S: Radar plot displaying the parameters derived from the JIP-test. Values are normalized to the control values; the x-axis is in logarithmic scale (base 2). Each parameter is described in Supplementary Information (Strasser *et al.* 2004), statistical analysis results are displayed in Supplementary Information. Treatments displayed in the legend are Control (Cont), ammonium sulfate addition (AS), cadmium addition (Cd) and combined treatment (AS+Cd).

