Electronic Supplementary Material (ESI) for Environmental Science: Nano.

Figure S1

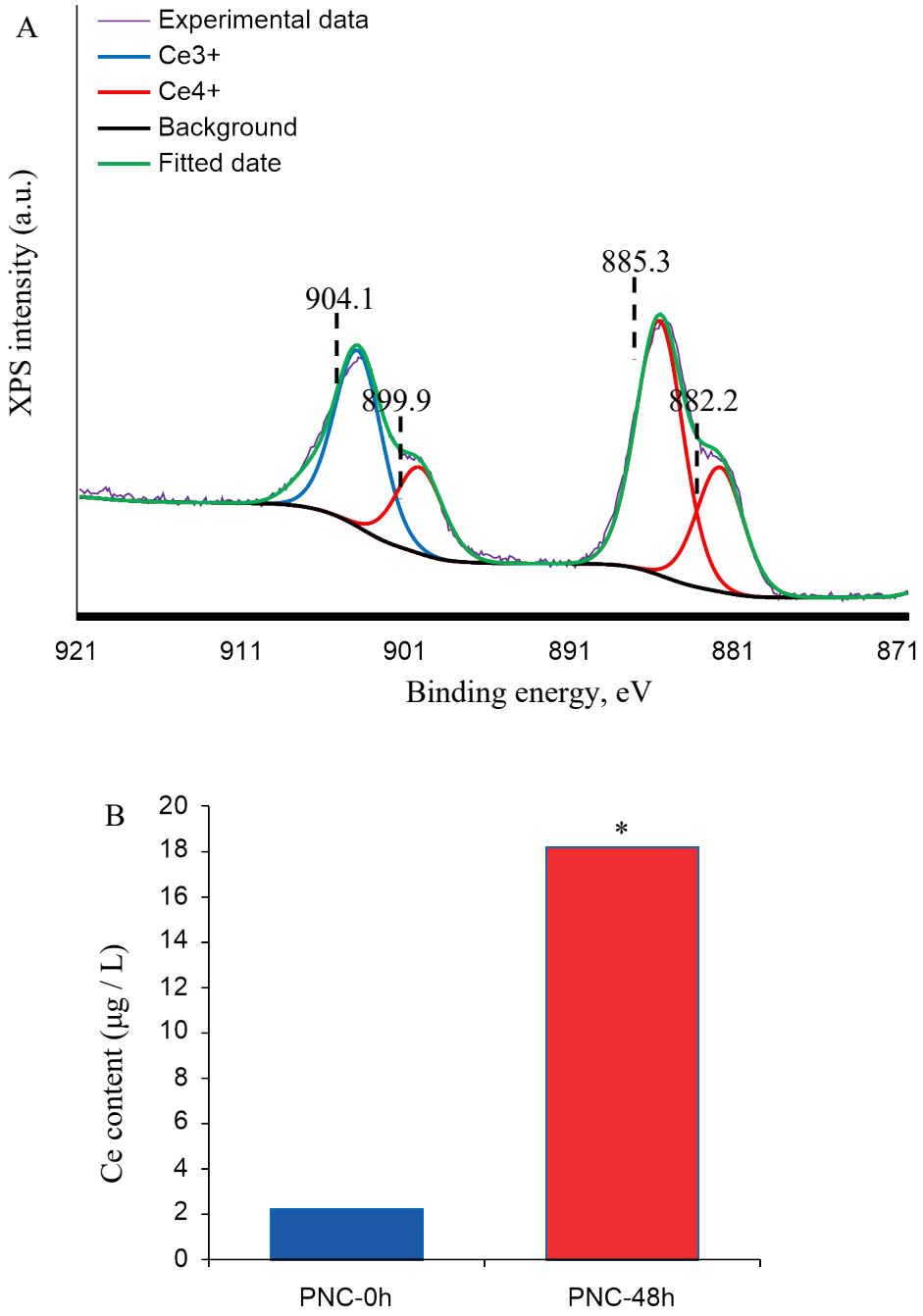

Figure S1. XPS and dissolution assay of PNC. A, XPS analysis of the synthesized PNC. B, the measured dissolved cerium content from the dialysis eluent collected from the mixture of PNC and leaf extracts (0 h and 48 h incubation).

Figure S2

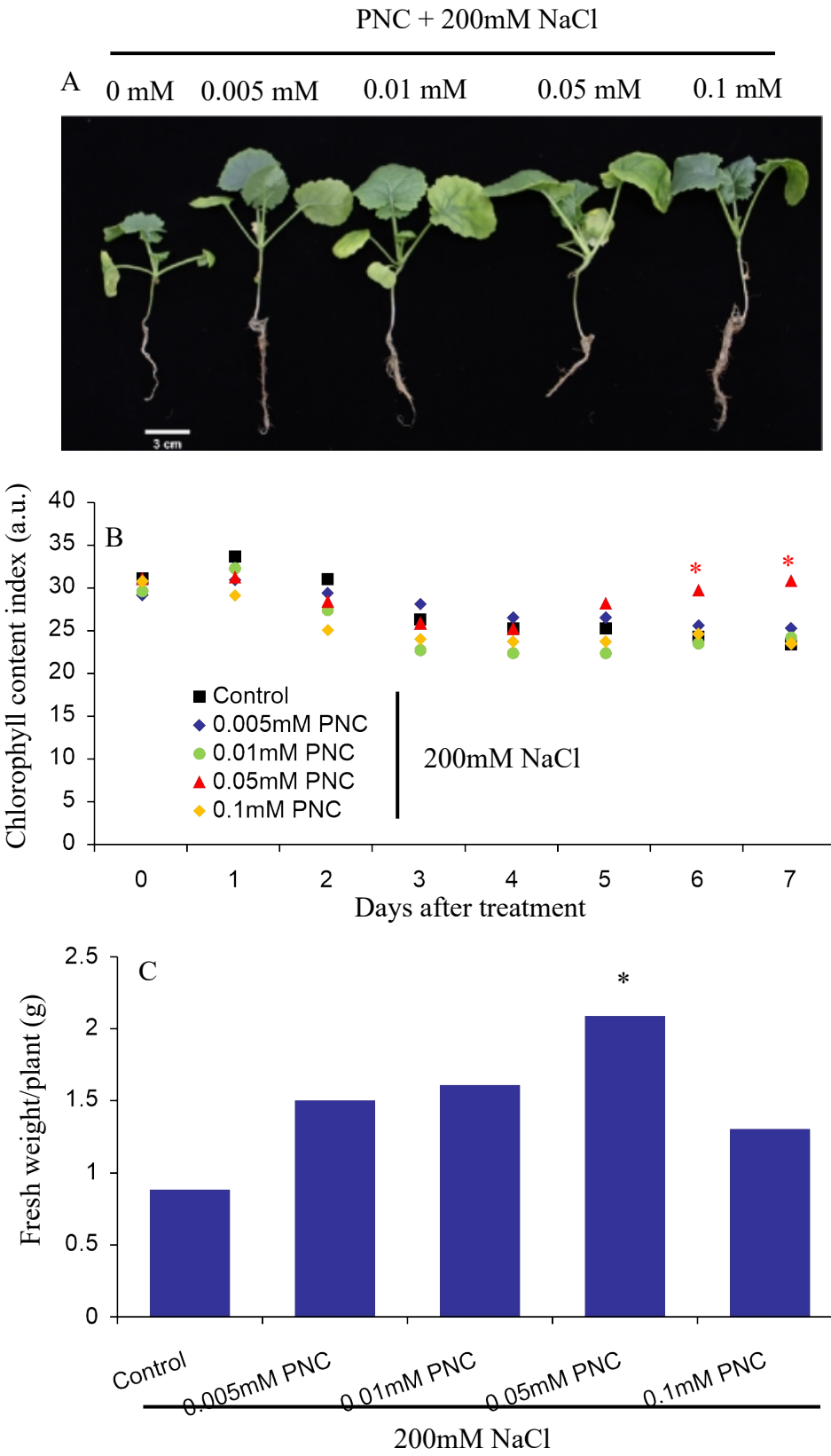

Figure S2. Screening of optimal PNC concentration to improve rapeseed salt tolerance. A, phenotypic performance of 0, 0.005, 0.01, 0.05, 0.1 mM PNC treated rapeseed seedlings after 12 days of salt stress (200 mM NaCl). B, the time course of chlorophyll content level (CCI, chlorophyll content index) in PNC and buffer treated rapeseed under salt stress (day 1 to day 12). C, fresh weight of whole rapeseed seedlings treated with different concentrations of PNC after 12 days of salt stress. Mean ± SE (n = 8-16). *, $P < 0.05$.

Figure S3

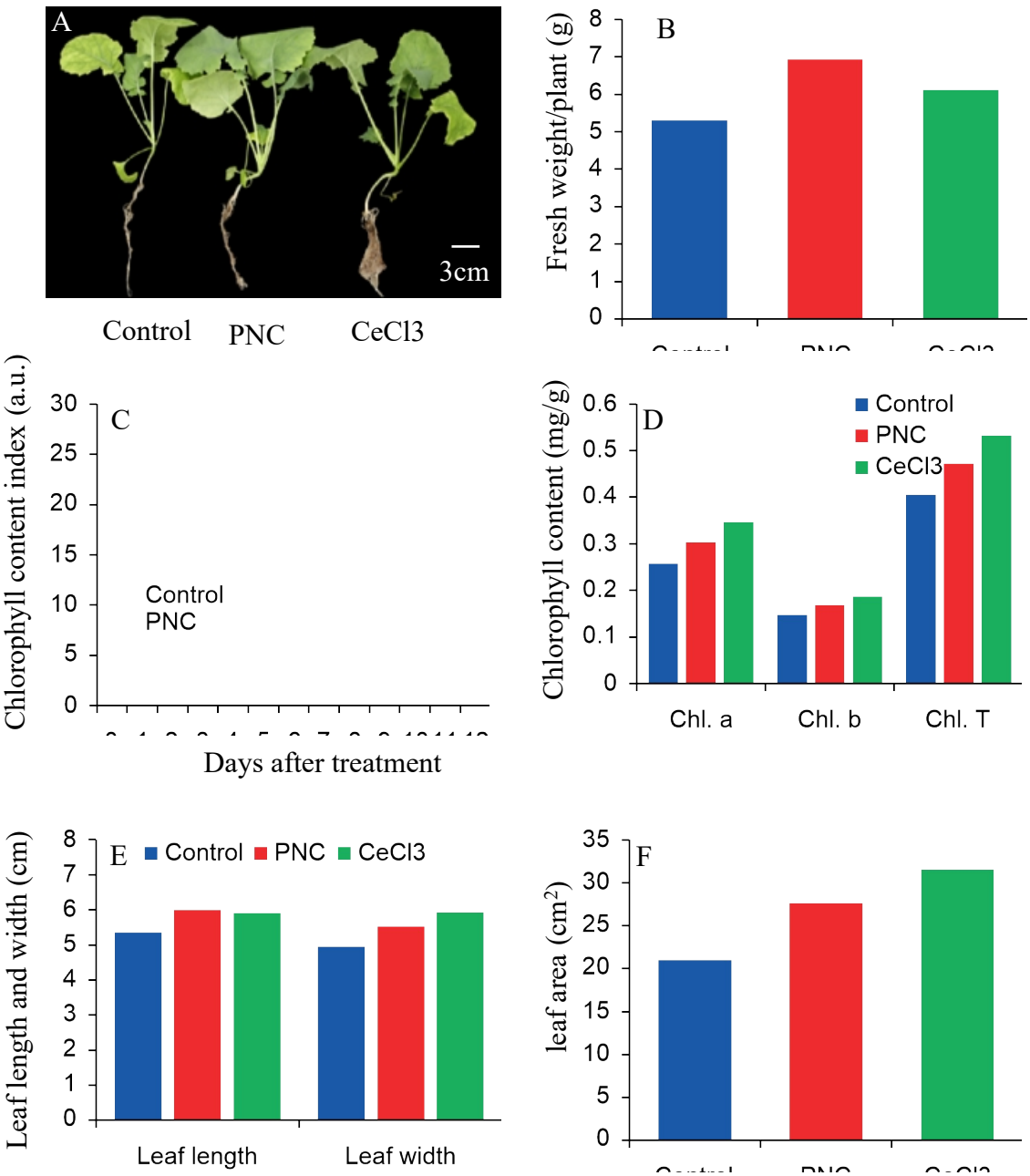

Figure S3. Effects of PNC and $CeCl_3$ on rapeseed seedlings growth under normal conditions. A-F, Seedling phenotype (A), fresh weight (B), chlorophyll content index (C), chlorophyll content (D), leaf length and width of the second true leaf (E), and leaf area of the second true leaf (F) of rapeseed plants treated with buffer, PNC, and $CeCl_3$ under normal condition.

Figure S4

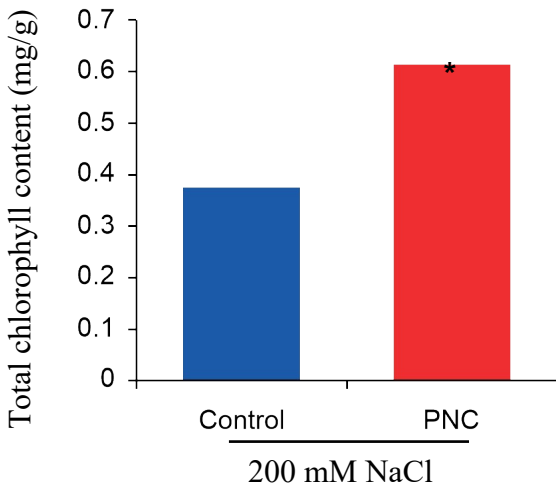

Figure S4. PNC increased the chlorophyll content of rapeseed leaves under salt stress. Total chlorophyll content of the second true leaf of rapeseed plants treated with PNC and buffer after 12 days' salt stress (200 mM NaCl). Mean ± SE (n = 8). *, $P < 0.05$.

Figure S5

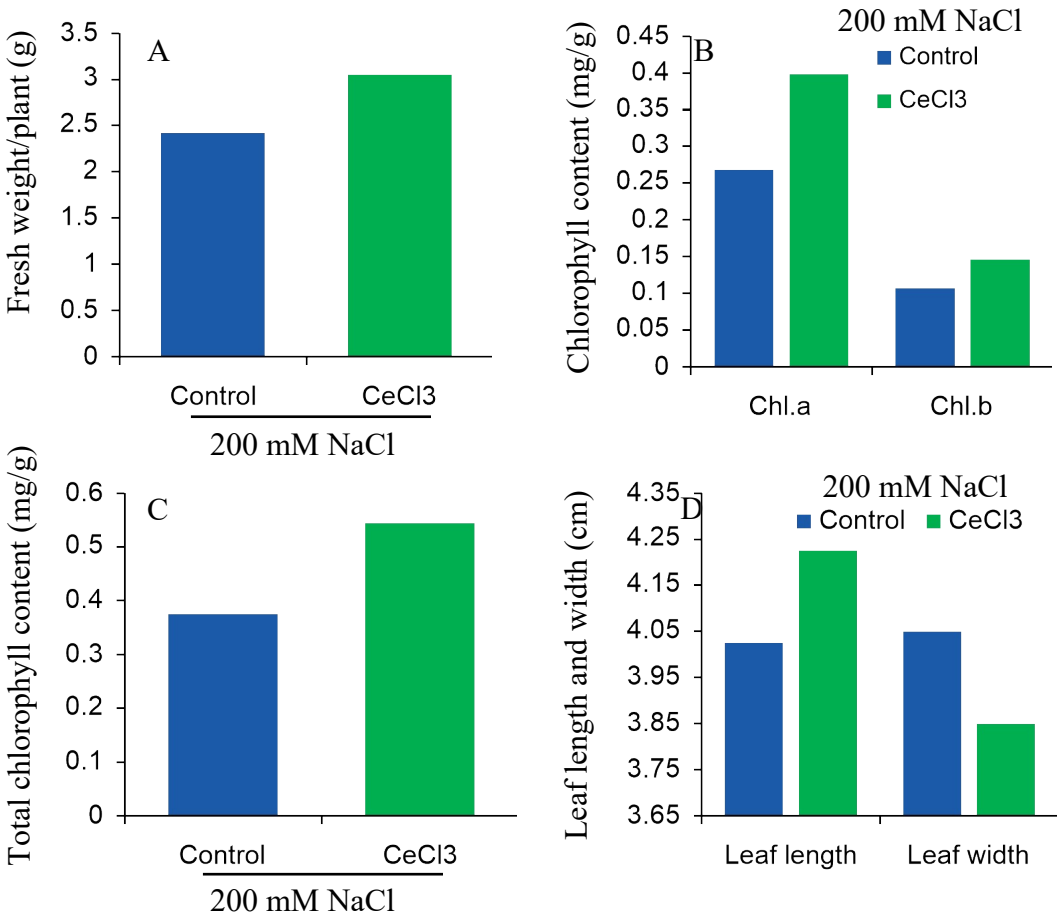

Figure S5. Effect of $CeCl_3$ on rapeseed seedling under salt stress. A-D, fresh weight (A), chlorophyll a and b content (B), total chlorophyll content (C), and leaf length and width of the second true leaf (D) of rapeseed plants treated with buffer or $CeCl_3$ after 12 days of salt stress (200 mM NaCl). Mean ± SE (n = 6-8).

Figure S6

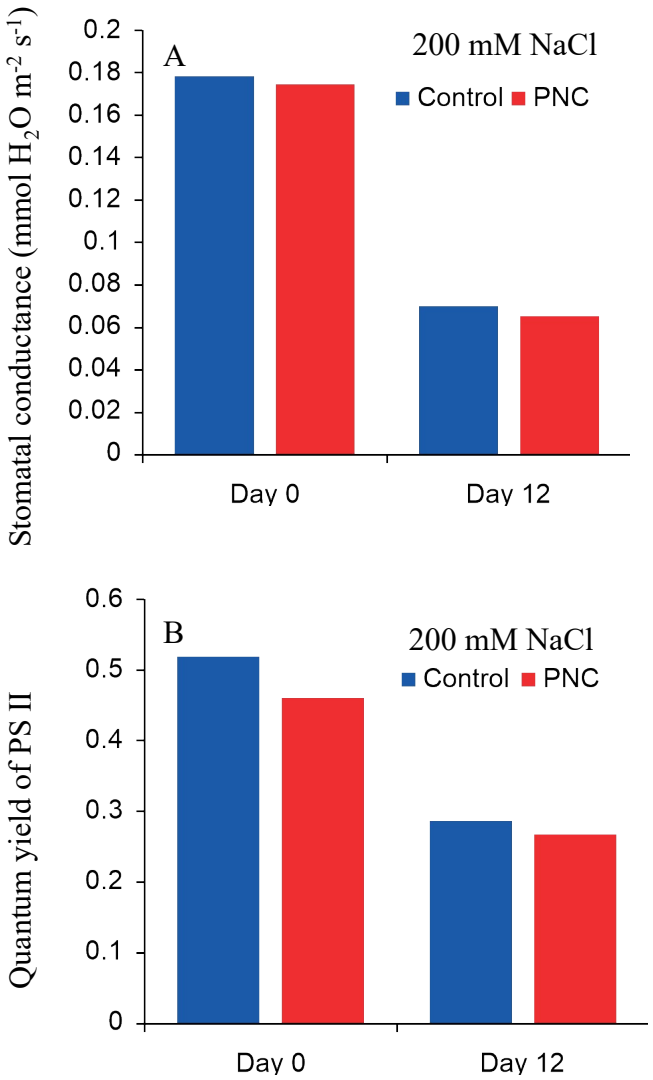

Figure S6. Effect of PNC on stomatal conductance and quantum yield of PS II of rapeseed leaves under salt stress. No difference in stomatal conductance (A) and quantum yield of PS II (B) were observed between rapeseed plants treated with buffer and PNC after 12 days of salt stress (200 mM NaCl). Mean ± SE (n = 4).

Figure S7

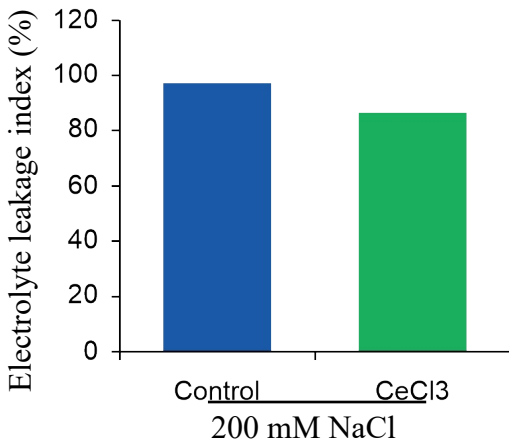

Figure S7. Effect of $CeCl_3$ on leaf electrolyte leakage index in rapeseeds under salt stress. No difference in electrolyte leakage index was observed between rapeseed plants treated with buffer and $CeCl_3$ after 12 days of salt stress (200 mM NaCl). Mean ± SE (n = 6).

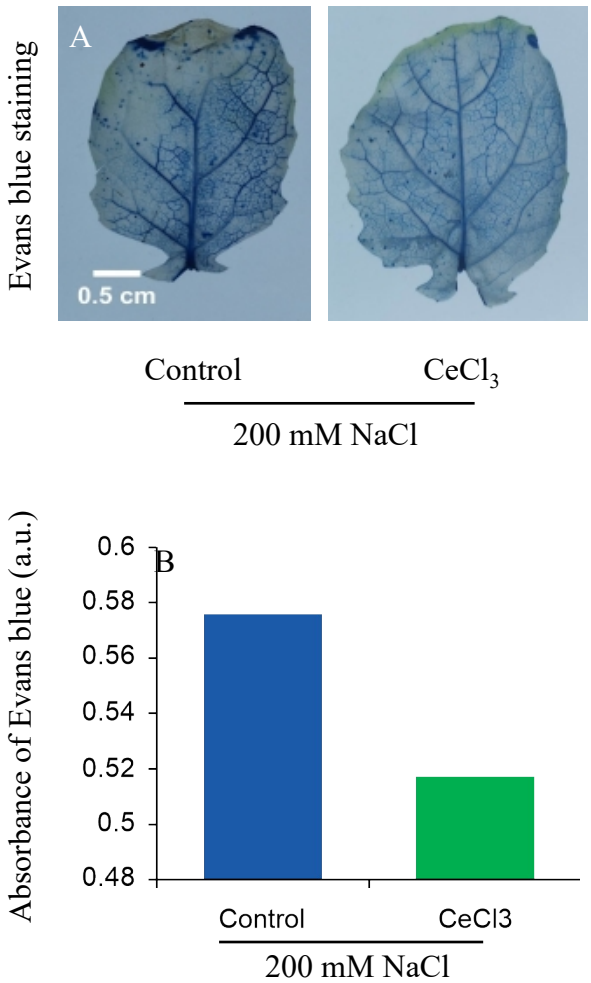

Figure S8. Effect of $CeCl_3$ on leaf cell viability of rapeseeds under salt stress. A, Evans blue staining of leaves from plants treated with $CeCl_3$ and buffer after 12 days of salt stress (200 mM NaCl). The blue spots represent dead cells. B, the absorbance of extracted Evans blue. Mean ± SE (n = 4).

Figure S9

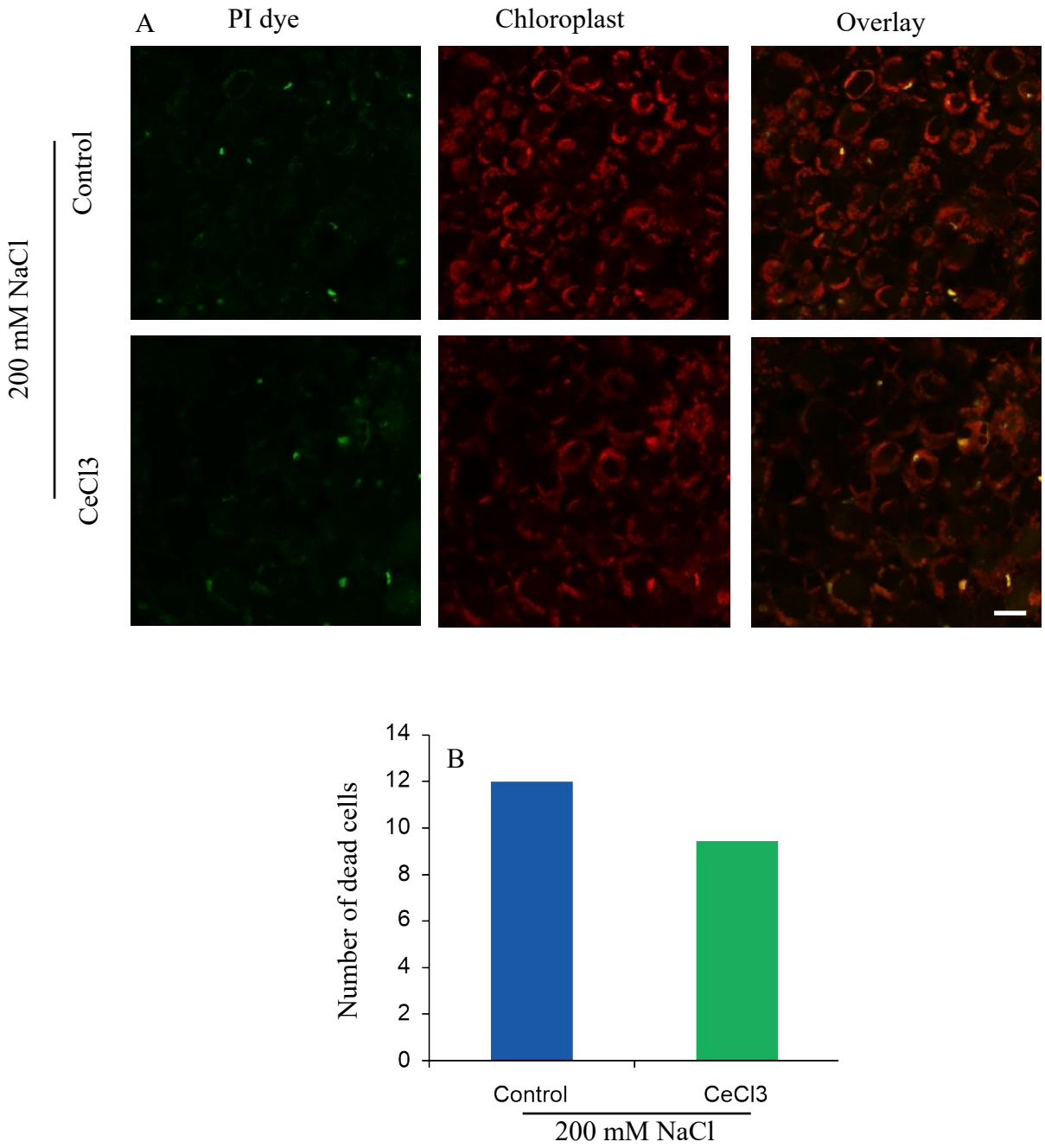

Figure S9. Effect of $CeCl_3$ on leaf cell membrane permeability of rapeseeds under salt stress. A, confocal imaging of fluorescence signal of propidium iodide (PI) from rapeseed leaf treated with $CeCl_3$ and buffer after 12 days of salt stress (200 mM NaCl). Green fluorescent dots represent the stained nucleus. B, the calculated number of dead cells per confocal image. Confocal image scale bar, 30 μm. Mean ± SE (n = 9).

Figure S10

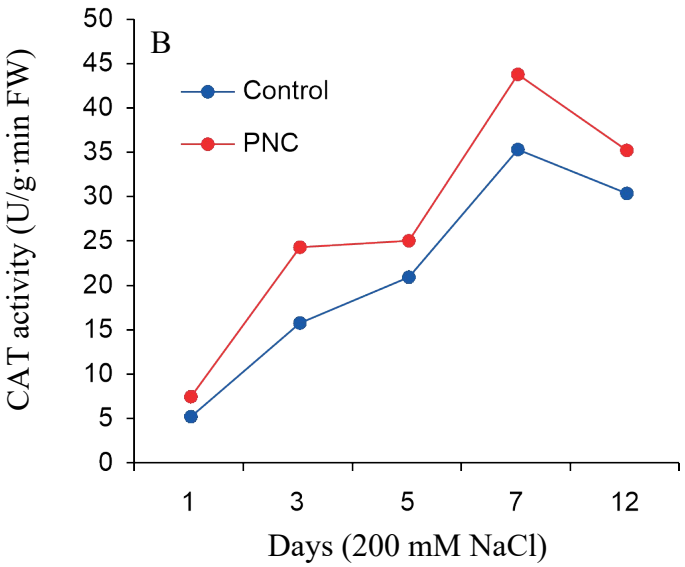

Figure S10. Effect of PNC on CAT activities in rapeseeds under salt stress. No difference in CAT activitied was observed between rapeseed plants treated with PNC and buffer under salt stress (200 mM NaCl). Mean ± SE (n = 6).

Figure S11

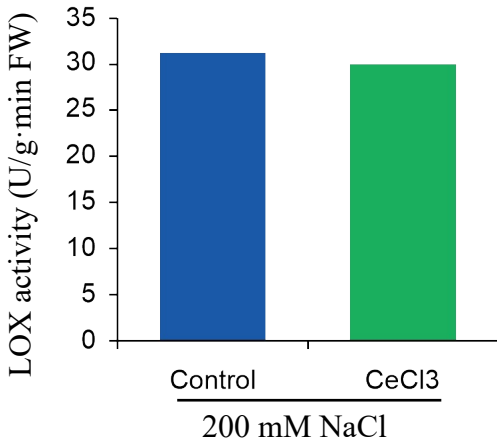

Figure S11. Effect of $CeCl_3$ on leaf lipoxygenase activities in rapeseeds under salt stress. No difference in lipoxygenase activities was observed between rapeseed plants treated with buffer and $CeCl_3$ after 12 days of salt stress (200 mM NaCl). Mean ± SE (n = 6).

Table S1. Primers for quantitative real-time PCR (qRT-PCR) analysis..

Gene Names	Sense primers (5′-3′)	Antisense primers (5′-3′)	Article
LOX2	TCTCCAGACCTTAAACATAGCAA	GTACACCGTCCTCTCAGGTT	
LOX3	GATCGGAGACCAAGAACGTC	TTGTTCCTCACCGTAACCACA	
Mn-SOD	AATCCAGACCTTCACGCT	ATGCAGCTTGACGACAGT	
Cu/Zn-SOD	ATGTCTTCAATTCACACAAG	TCGATTTAATGGATTGAAGTG	
Fe-SOD	TCCAATTATCAGCTTGGATGT	TTAGGCAATTGGGATGTTGG	
Actin	CTGACCGTATGAGCAAAG	CCACCGAACCAGAAGGCAGA	(Zhao et al., 2018)