

## Supporting Information

### **Effects of multifunctional cerium-doped carbon dots on photosynthetic capacity and nutritional quality of lettuce**

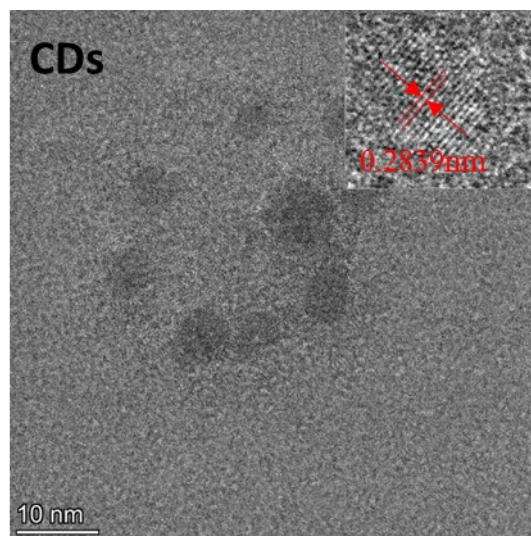
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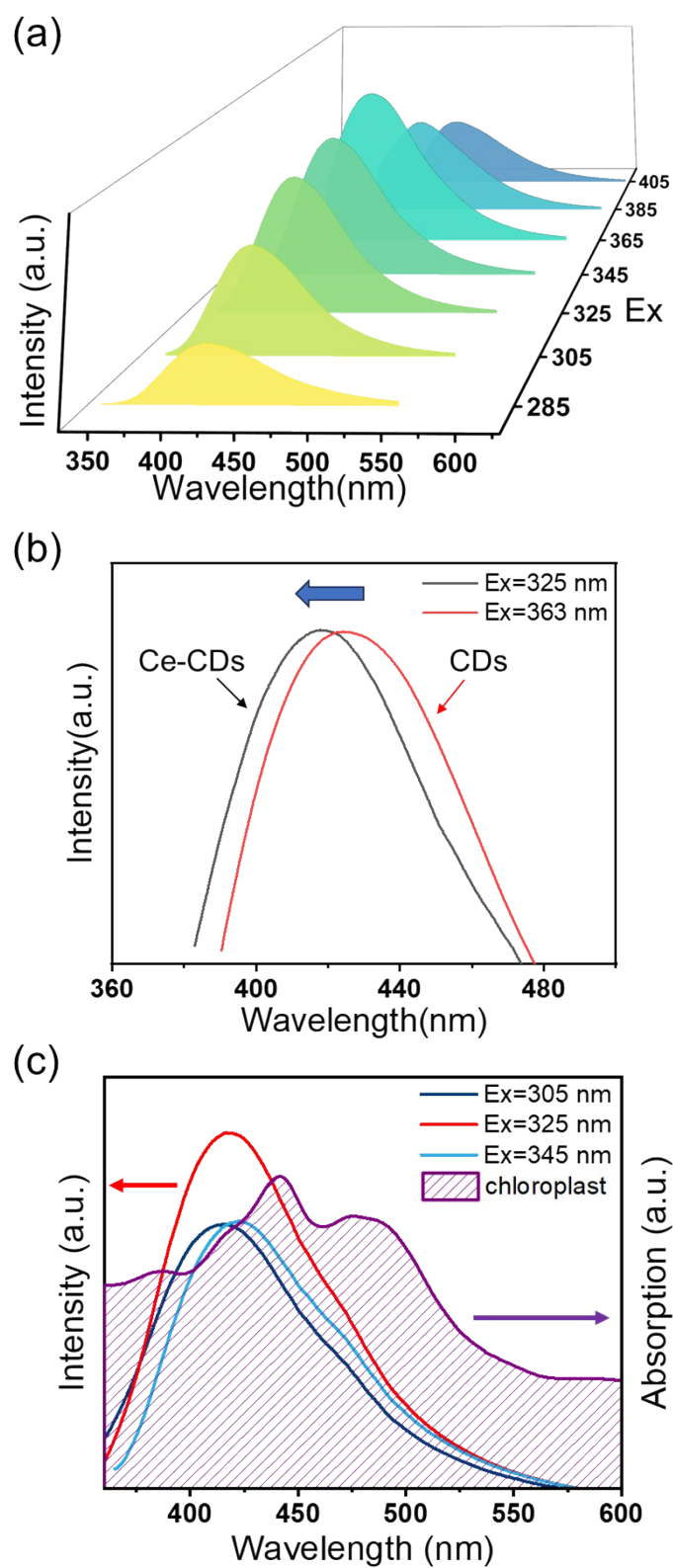
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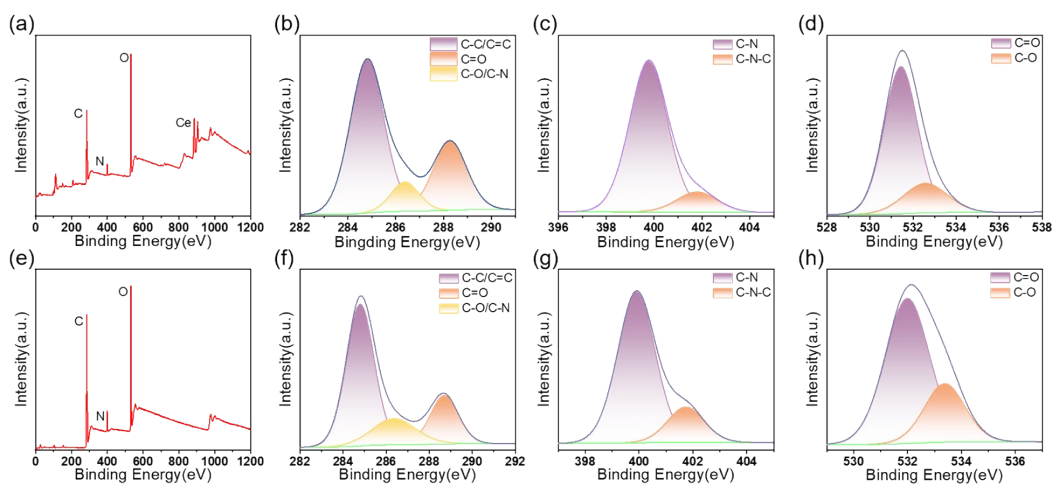
*Gaozhou Shenli Agricultural Technology Co., Ltd., Maoming 525254, China*



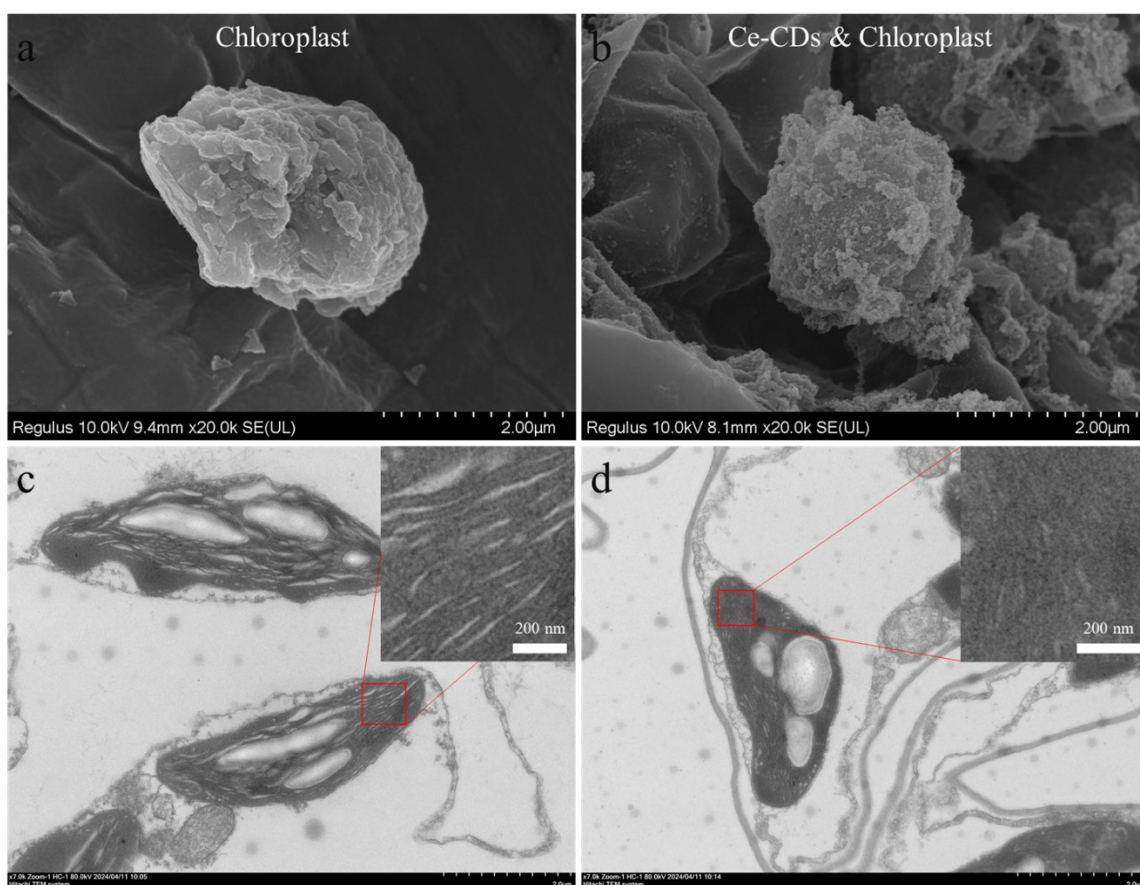
**Fig S1.** High-resolution transmission electron microscopy (HR-TEM) images of CDs with the accompanying: crystal spacing map.



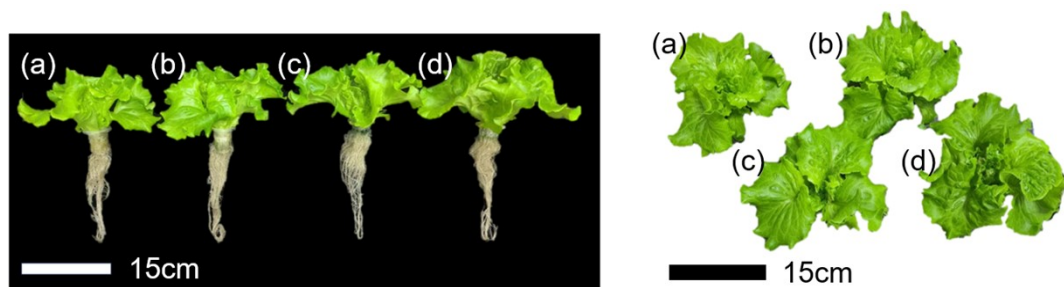
**Fig S2.** (a) Emission spectra of CDs with excitation wavelengths of 285 ~ 405 nm, (b) Optimal excitation spectra of Ce-CDs and CDs, (c) Excitation spectra of Ce-CDs at 305, 325 and 345 nm and UV-Vis absorption spectra of chloroplasts.



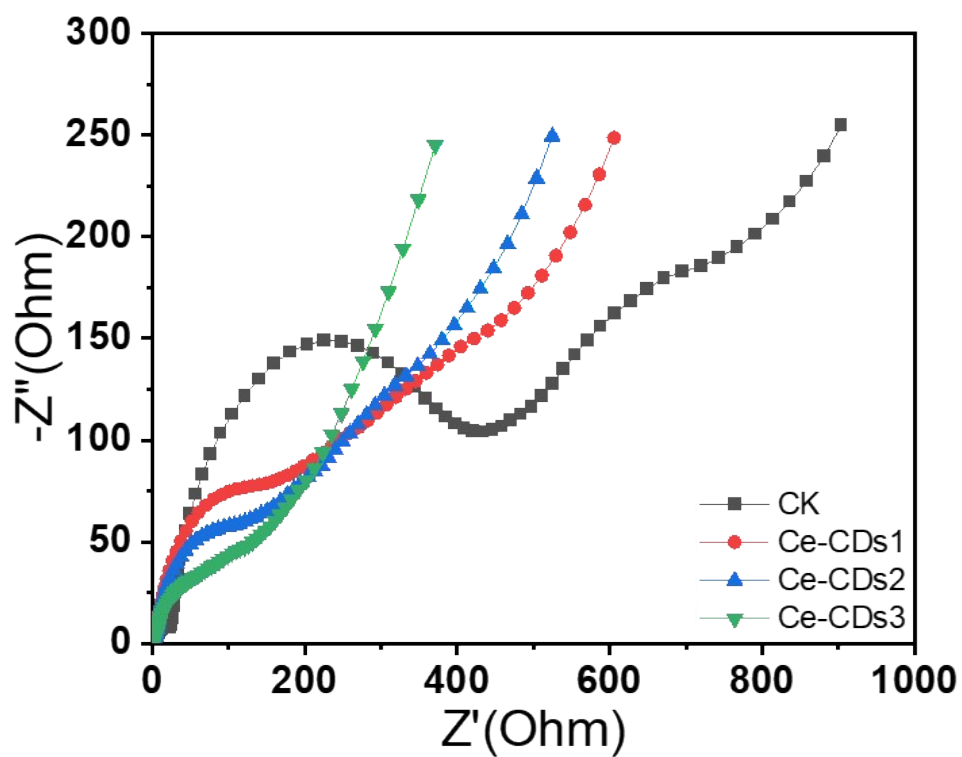
**Fig S3.** (a) Full-scanning XPS spectra of Ce-CDs; (b) C1s, (c) N1s, (d) O1s; (e) Full-scanning XPS spectra of CDs, (f) C1s, (g) N1s, (h) O1s.



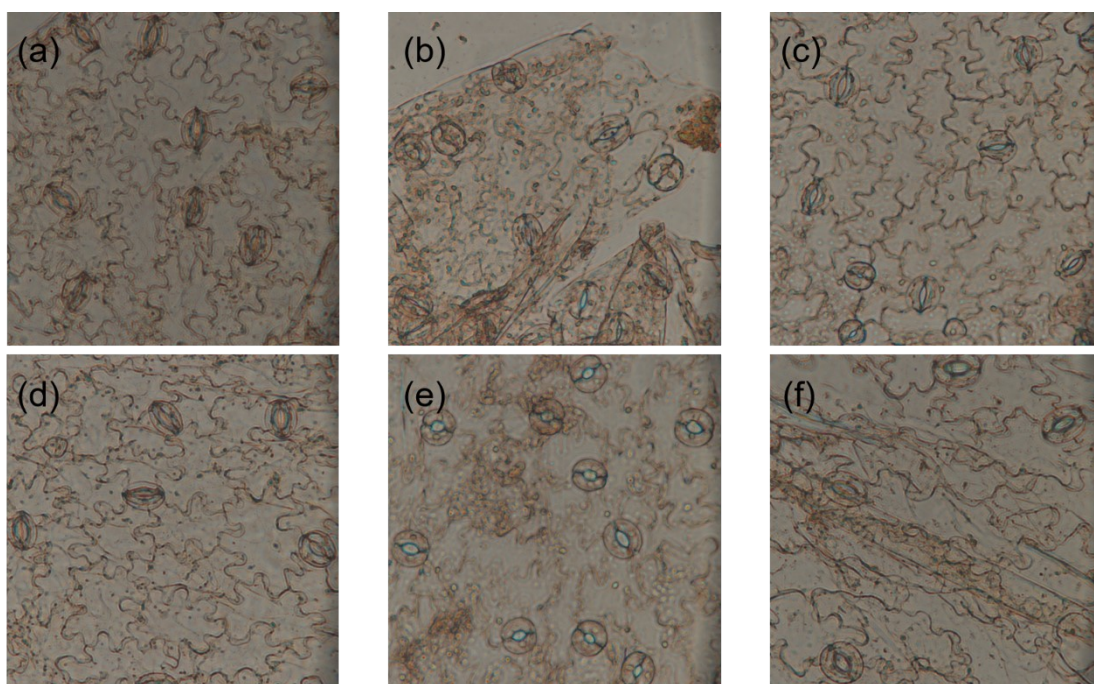
**Fig S4.** SEM (A and B) and TEM (C and D) images of chloroplasts alone and Ce-CDs& chloroplasts



**Fig S5.** Lettuce with different treatments: (a) blank treatment group, (b) 100 mg L<sup>-1</sup>Ce treatment group, (c) 100 mg L<sup>-1</sup>CDs treatment group, (d) 100 mg L<sup>-1</sup>Ce-CDs treatment group.



**Fig S6.** Impedance map of Ce-CDs.



**Fig S7.** Stomatal images of different treatment groups (a) blank treatment group, (b) 100 mg L<sup>-1</sup>Ce treatment group, (c) 100 mg L<sup>-1</sup>CDs treatment group, (d) 50 mg L<sup>-1</sup>Ce-CDs treatment group, (e) 100 mg L<sup>-1</sup>Ce-CDs treatment group, (f) 150 mg L<sup>-1</sup>Ce-CDs treatment group.