

Supporting information

Pollen Derived Blue Fluorescent Carbon Dots for Bioimaging and Monitoring of Nitrogen, Phosphorus and Potassium Uptaken in *Brassica parachinensis* L.

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Compared with CK, there was the highest contents of soluble sugars in *Brassica parachinensis* L. of T2, was increased by 0.95 mg/g, and T3 had no significant different from T2. T1 position middle among CDs treatments, was increased by 69.44% compared CK (**Figure S1a**). The CDs under T1 had the lowest content of soluble protein of 3.71 mg/g, but there was no significant difference among the treatment (CK, T2, T3) (**Figure S1b**). The nitrate content was significantly affected by different CDs concentration (**Figure S1c**). Both T2 and T3 in Hoagland nutrition solution was significant lower than that of CK, which shown a decrease of 24.96% and 8.21%, respectively. In contrast, the nitrate content under T1 was higher than CK, which increased by 8.08%. The MDA content supplementary CDs treatments significant higher than CK, and the three treatments had no difference among these (**Figure S1d**).

From **Figure S2**, T1 had the lowest nitrogen content (44.28 mg/g), both the T2 and T3 had no significant difference, but significant decreased 5.62% and 6.23%, respectively, than CK. As for phosphorus content, there was no significant difference in plant among each treatment (**Figure S2b**). However, different supplementary CDs significant affected potassium content of *Brassica parachinensis* L., T2 had the highest potassium content, which was increased 42.12% than CK. Compared with CK, T1 and T3 was increased 42.12% and 21.90%, respectively, presented significant difference among treatments (**Figure S2c**).

Figure S3 showed that the CK absorbed rate of total nitrogen (ammonium and nitrate nitrogen) content was faster than T2 (**Figure S3 a, b**), but the content of phosphorus and potassium had the otherwise tendency, especially from start

beginning measured nutrition solution to 6th days, supplementary T2 was significantly decreased than CK in the content of phosphorus and potassium, and before harvested 3 days, the content of total nitrogen, phosphorus and potassium had no significant difference between two treatments. CK had been measured fluorescence intensity during 15 days presented no significant difference (**Figure S3e**), but T2 had the fluorescence intensity significant decreased with the time increased (**Figure S3f**).

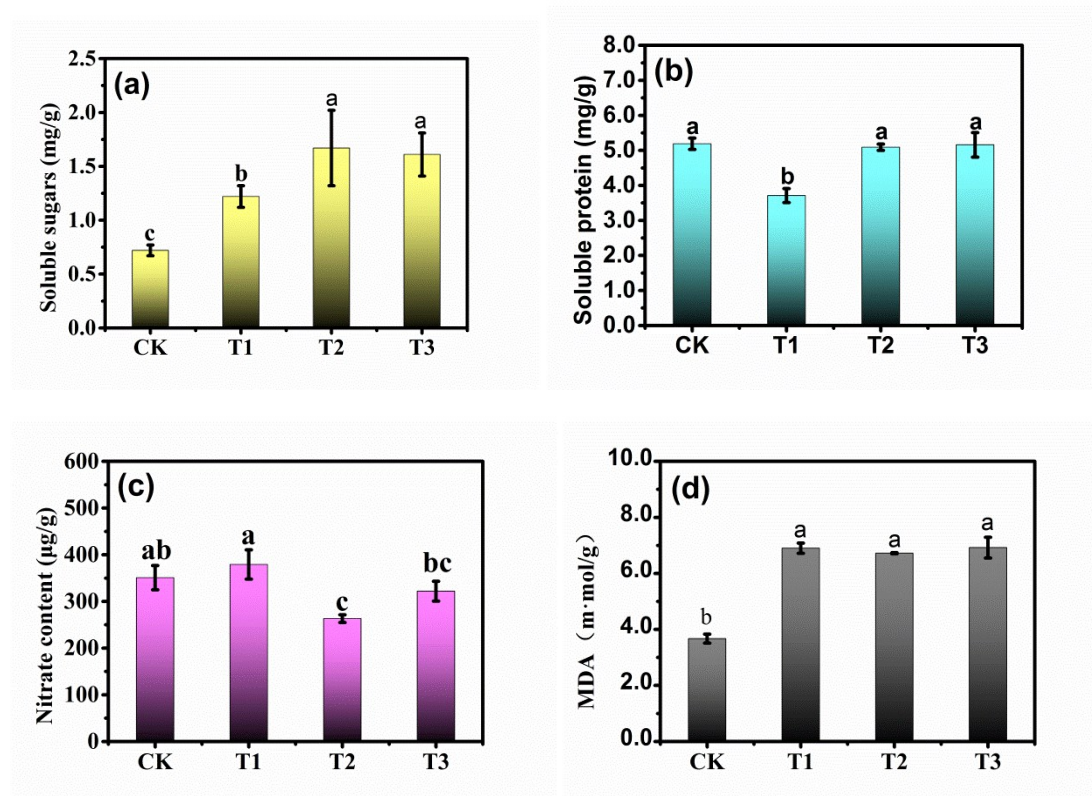


Figure S1. Suggested that the effects of CDs concentration on the content of soluble sugar (a), soluble protein (b), nitrate (c) and MDA (d) in the *Brassica parachinensis L.* The values presented are the means \pm SE. Different letters indicate significant differences between treatments ($\alpha < 0.05$), similarly hereinafter.

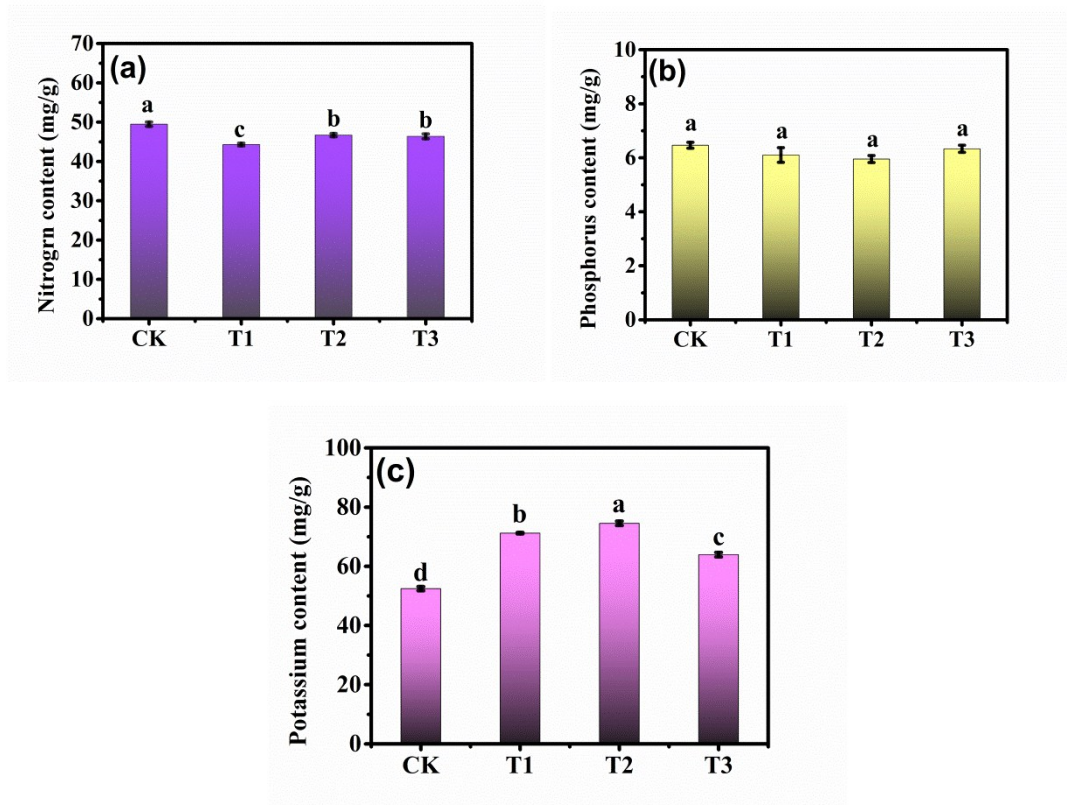


Figure S2. The effect of different CDs concentration of the content nitrogen (a), potassium (b) and phosphorus (c) in *Brassica parachinensis* L..

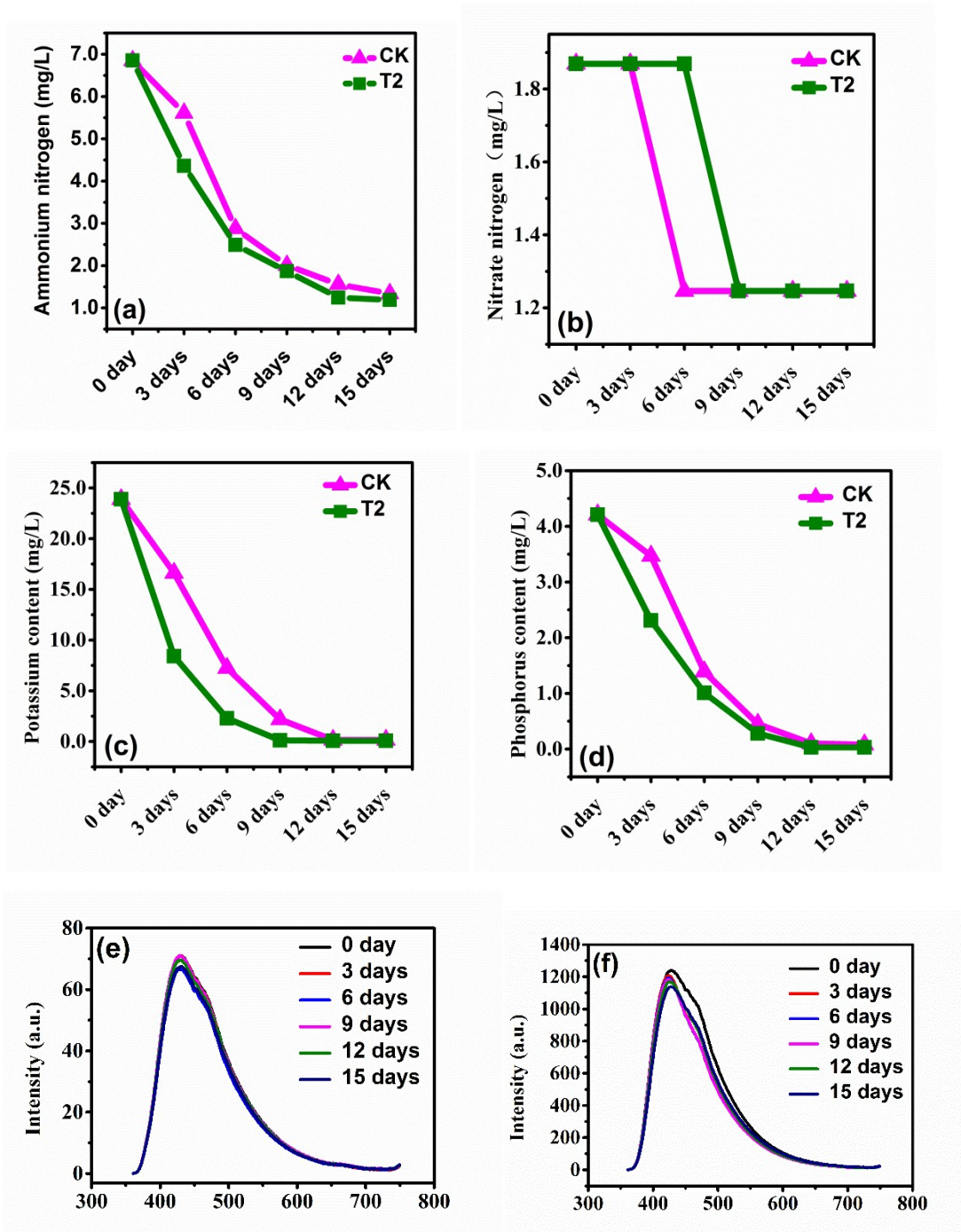


Figure S3. The effect of CK and T2 of the contents ammonium nitrogen (a), nitrate nitrogen (b), potassium (c) and phosphorus (d) in nutrition solution. The fluorescence intensity of CK (a) and T2 (b) in nutrition solution

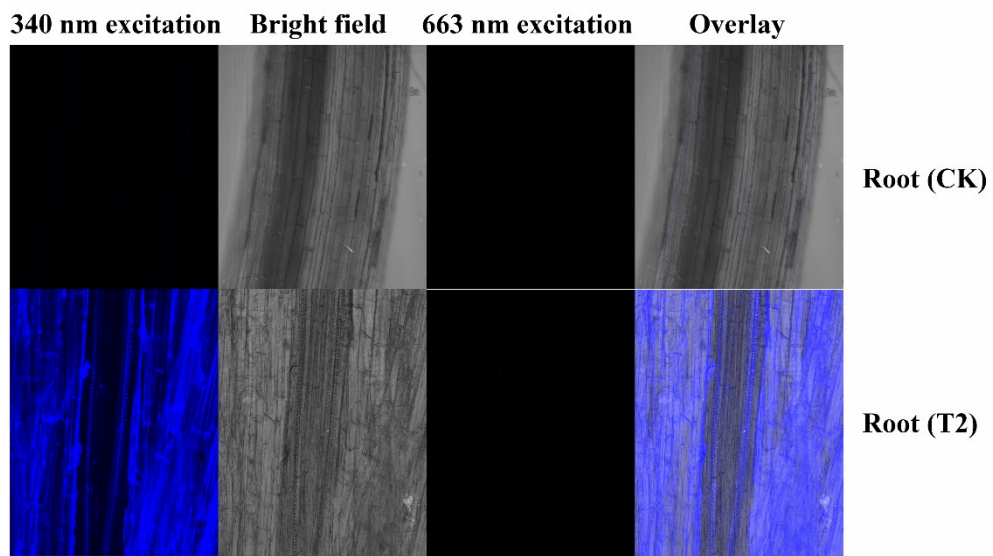


Figure S4. The images of laser scanning confocal microscope in root of *Brassica parachinensis* L..

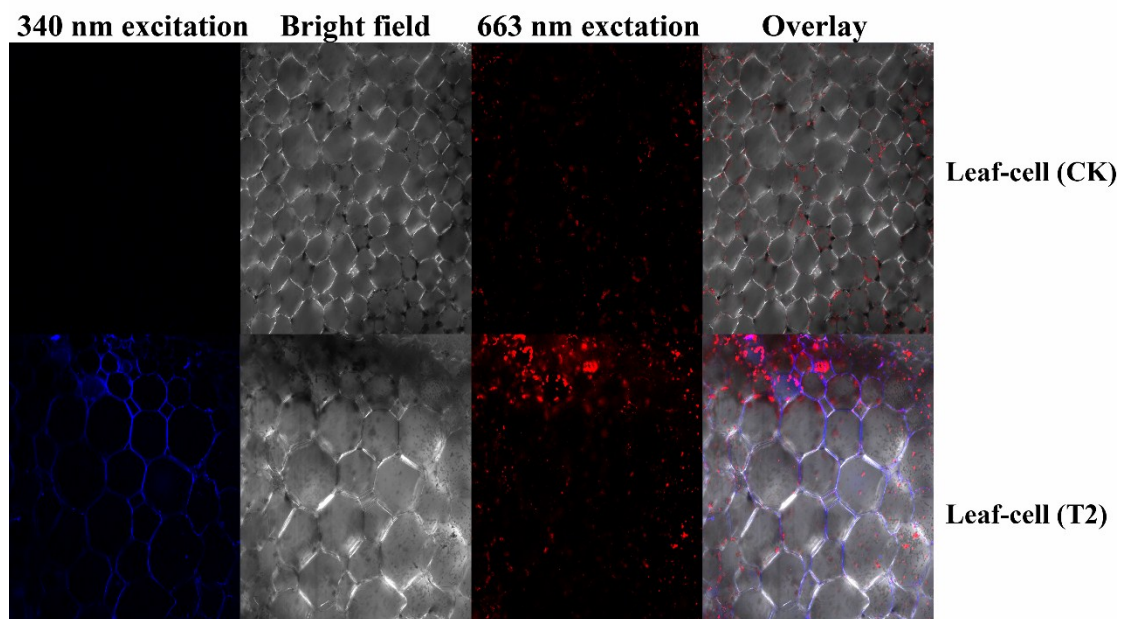


Figure S5. The images of laser scanning confocal microscope in leaf-cell of *Brassica parachinensis* L..

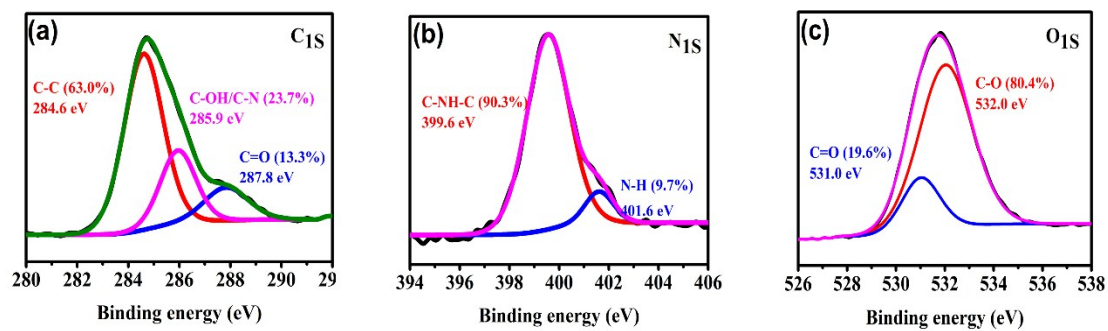


Figure S6 (a) the individual spectra for C_{1s}, (b) N_{1s} and (c) O_{1s} binding energy after peak-fit processing of CDs.