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Supplementary information

Biomimetic preparation of silicon quantum dots and its phytophysiology effect on cucumber seedling

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1. Determination of Si content

Si content of cucumber seedling roots was measured by the molybdenum-blue colorimetric method according to the previous method.[1] 0.3g dried roots were put into porcelain crucibles and ashed in muffle furnace for 3h at 300 ºC. Then the temperature of muffle furnace was kept at 550ºC for 4h until the roots turned gray-white. The ashes were washed with 50 mL of 0.08 M H_2SO_4 into 100 mL polyethylene bottles. In order to extract silica, the suspensions were added 2 mL 40% HF and then oscillated for 1h. After overnight at 23 ± 3 ° C, 2 mL of the solution was pipetted into 50 mL of 0.32% H_3BO_3 to remove excess HF. The resulting solution was a silicon solution. The content of silicon was measured by absorbance at 811 nm. The 100 μg/mL SiO_2 were served as standard solution of silicon.

2. The cytotoxicity of SiQDs

The endometrial cancer cells were purchased from the Cell Bank of Chinese Academy of Science. Cytotoxicity of SiQDs was determined by 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide assay (MTT).[2] The endometrial cancer cells were grown in a Dulbecco's modified Eagle's medium (DMEM) containing 10% v/v fetal bovine serum at 37 °C in an incubator containing 5% CO2. Before experiment, Cells were incubated for 24 hours in 96-well microtiter plates. Then, the original medium was removed, and a medium containing different concentrations of SiQDs was added to the cells. After 24 hours of incubation, relative cell viability was reflected by absorbance at 540 nm. All experiments were performed four times.

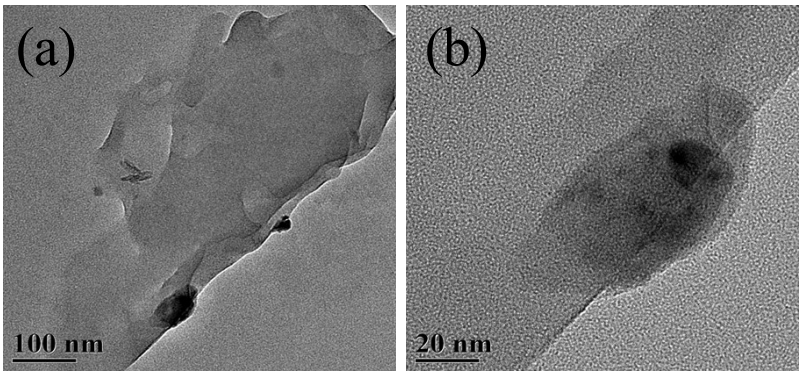

Figure S1. (a) The TEM image of diatom (b) The HRTEM image of diatom.

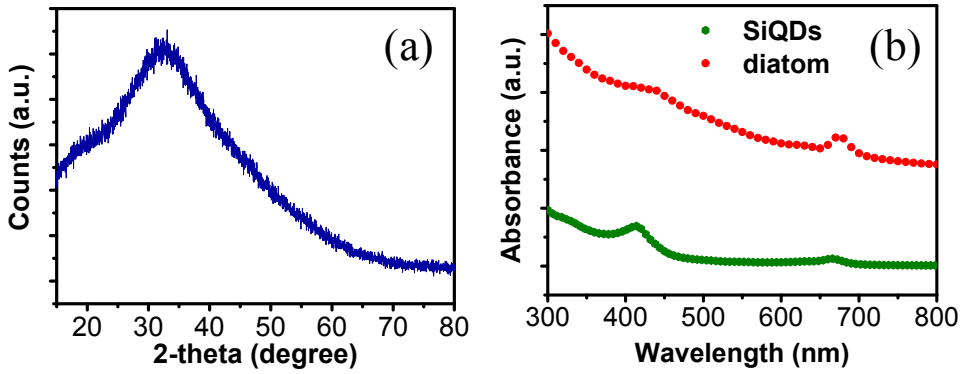

Figure S2. XRD pattern of SiQDs, UV-vis absorption spectrum of diatom and SiQDs.

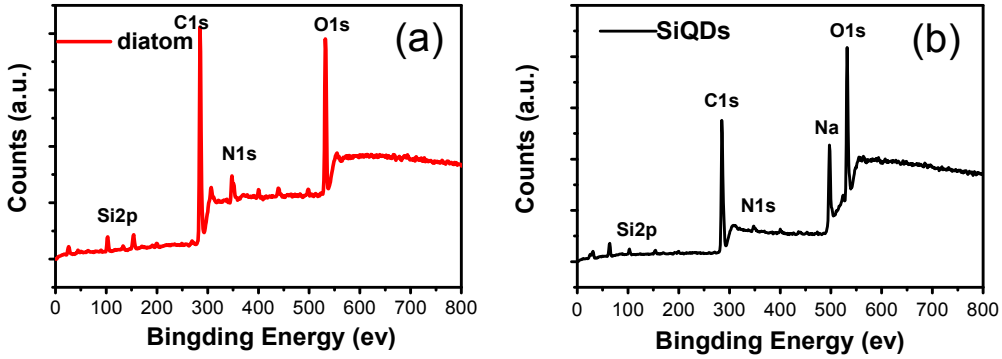

Figure S3. XPS spectrum of diatom (a) and SiQDs (b)

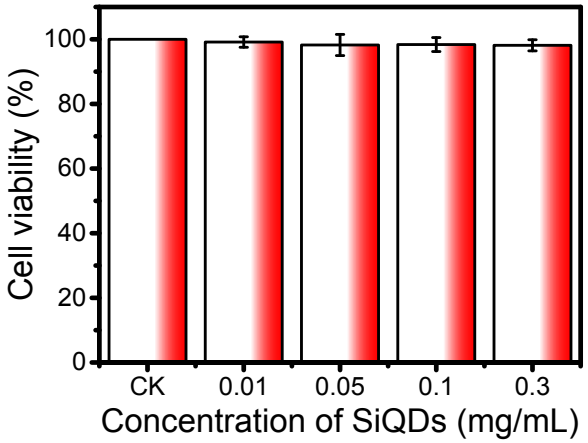

Figure S4. Cytotoxicity assessment of different concentrations of SiQDs on endometrial cancer cells by MTT assay.

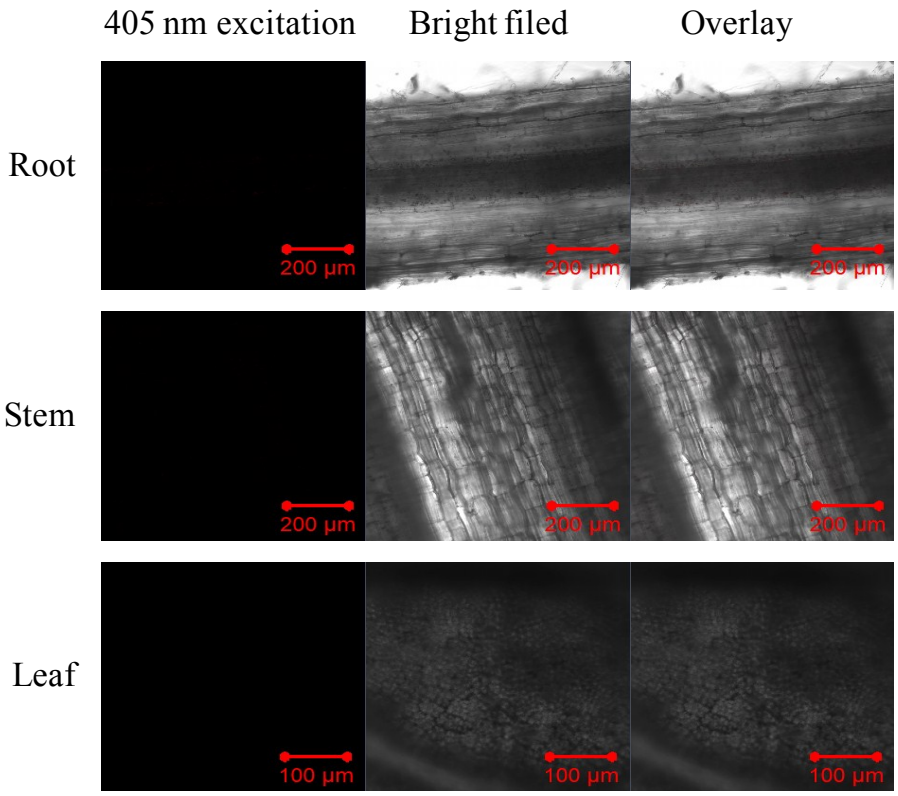

Figure S5. The confocal images of cucumber seedling root and stem longitudinal section and leaf transverse section after 10 days of cultivation with nutrient solution, excited at 405 nm.

Table S1. Gene primers of cucumber seedling root aquaporin-protein gene (CsPIP) and reference gene

Gene primers of aquaporin-protein gene real-time PCR

Gene	Accession number	Primer sequence (forward/reverse primer)	Amplified fragment (bp)
CsPIP1:2	KF641170	F 5′-CATTATTTACAACCACGACGAAGCA-3′ R 5′-GGATTGAAGAAGCATCATGGATTTAGA-3′	165
CsPIP2:1	KF641172	F 5′ -TTTGGGTTGGACCTTTCATTGGA-3′ R 5′ -ATACTCATGGCACACAATTATTAGGCTT-3′	158
CsPIP2:4	KF641175	F 5′ -GCTGCTCTGCTCTCATCTTGCC-3′ R 5′ -GAAAAATACATGAATAACAGGAGCCCC-3′	167
CsPIP2;5	KF641176	F 5′ -CAACCGTGAAAAACCCTGGAATGAC-3′ R 5′ -CATCTTCTTCCTCTCAGTTTGTGGGG-3′	161
ACT	TUBLIN	F 5′ - CTCCCTCCTTTTGGAGCGTT -3′ R 5′- GAAGCACAGCAACGTCAGTG -3′	150

[1] P. D. J. V. D. Vorm, *Commun. in Soil Sci. Plant Anal.*1987, **18**, 1181-1189.

[2] H. Wang, M. Zhang, Y. Song, H. Li, H. Huang, M. Shao, Y. Liu, Z.Kang, *Carbon* 2018, **136**, 94-102.