

Electronic Supplementary Information

Evaluation of the phytotoxicity of nano-particles on mung beans by internal extractive electrospray ionization mass spectrometry

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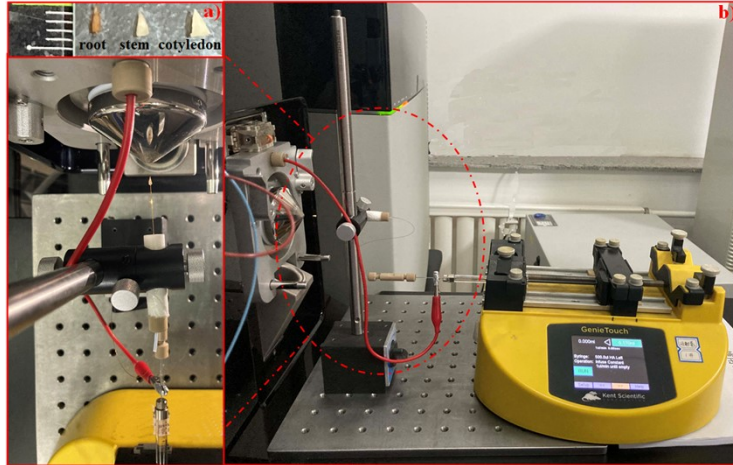


Fig. S1 a) The photos of triangle tissues (cotyledon, stem and root) for iEESI-MS analysis, b) the photo of experimental setup of iEESI-MS analysis of triangle tissues.

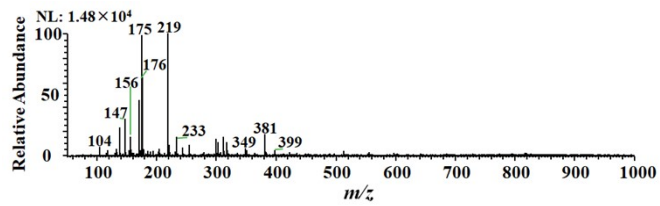


Fig. S2 The iEESI-MS of stem samples from mung bean sprout cultured in water for 45 h.

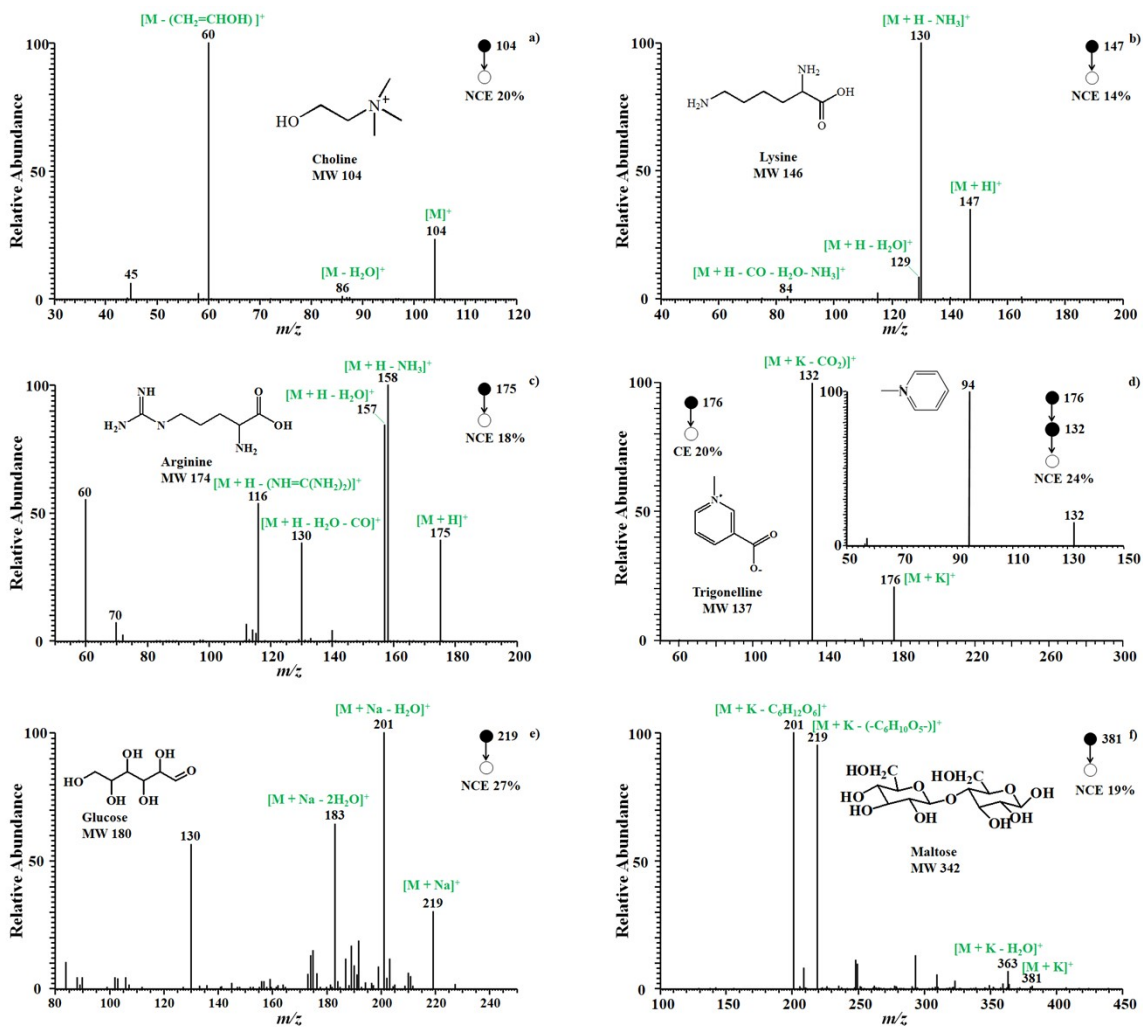


Fig. S3 The iEESI-MSⁿ spectra of characteristic compounds from mung bean sprouts. a) m/z 104 [choline]⁺, b) m/z 147 [lysine + H]⁺, c) m/z 175 [arginine + H]⁺, d) m/z 176 [trigonelline + K]⁺, e) m/z 219 [glucose + K]⁺, and f) m/z 381 [maltose + K]⁺.

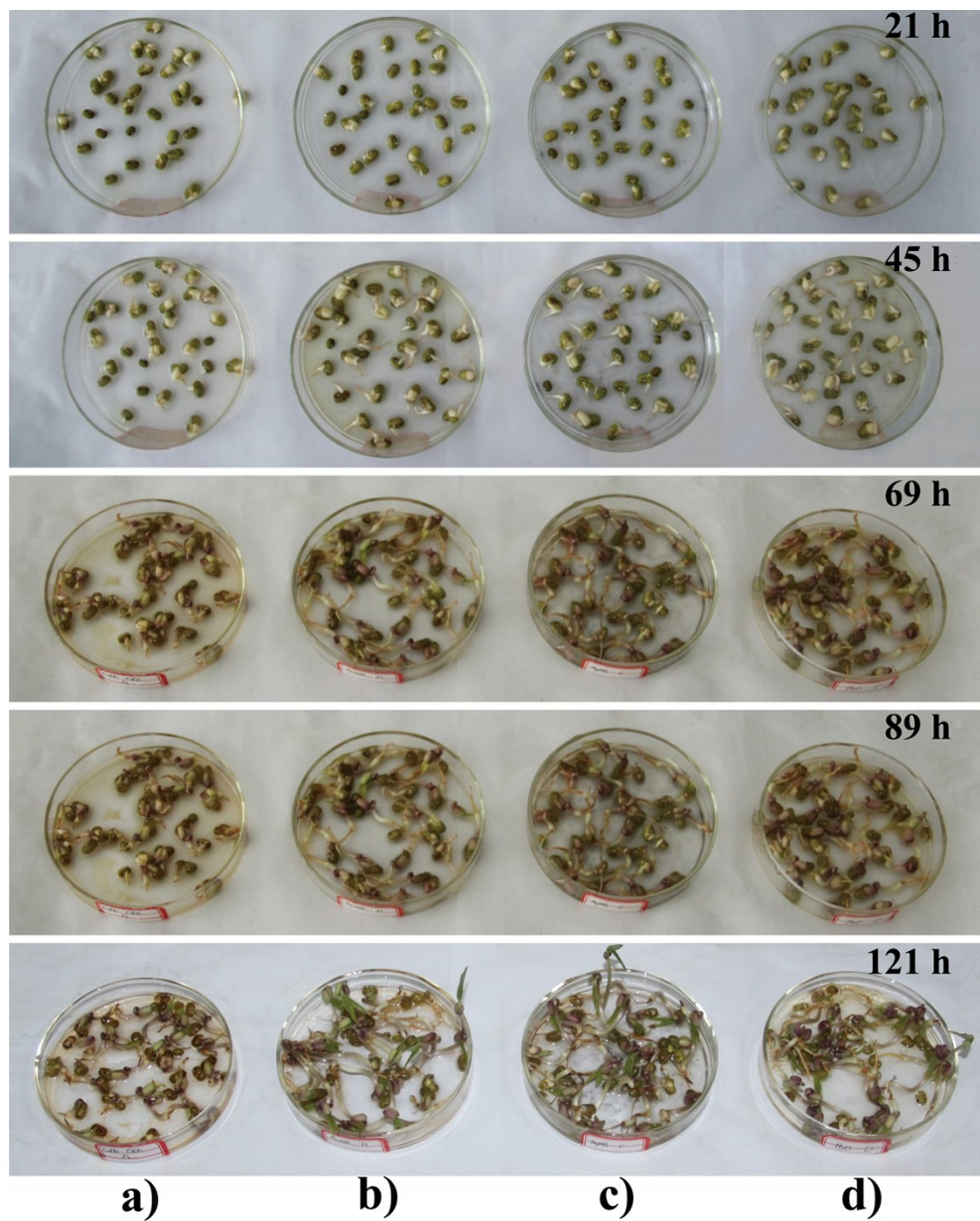


Fig. S4 The representative pictures of mung bean sprouts cultured in different media at different sample collection times. a) CdTe QDs, b) Au NPs, c) Ag NPs, d) and water.

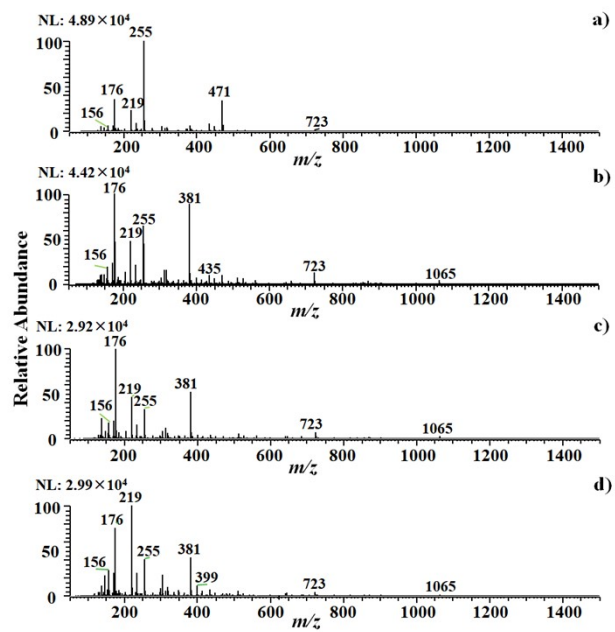


Fig. S5 The iEESI-MS of the root samples in different culture media at 21 h. a) Water, b) Ag NPs, c) Au NPs, and d) CdTe QDs.

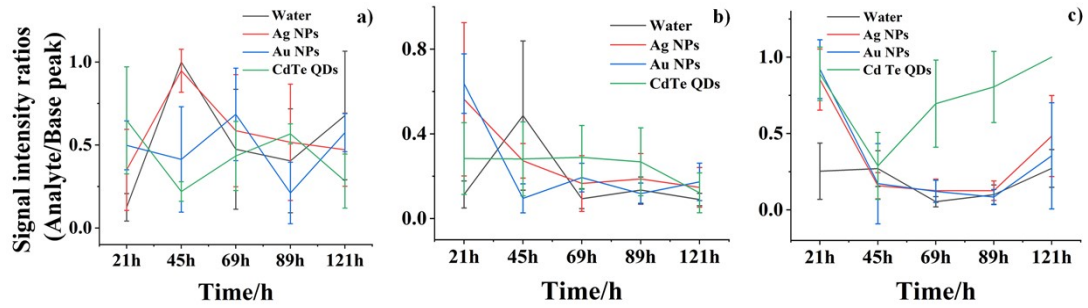


Fig. S6 The changes of characteristic compounds in the root samples cultured in water and three NPs (including Ag NPs, Au NPs and CdTe QDs) at different sample collection times. a) glucose, b) maltose and c) trigonelline. (Note: The mean \pm SD from 6 samples per group was shown.)

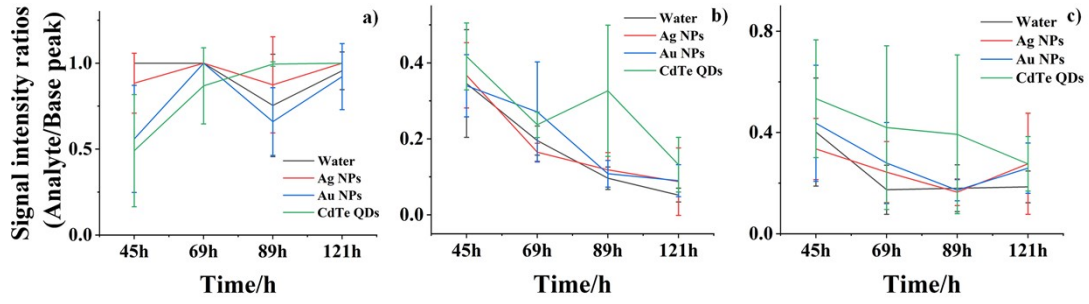


Fig. S7 The changes of characteristic compounds in the stem samples cultured in water and three NPs (including Ag NPs, Au NPs and CdTe QDs) at different sample collection times. a) glucose, b) maltose and c) trigonelline. (Note: The mean \pm SD from 6 samples per group was shown.)

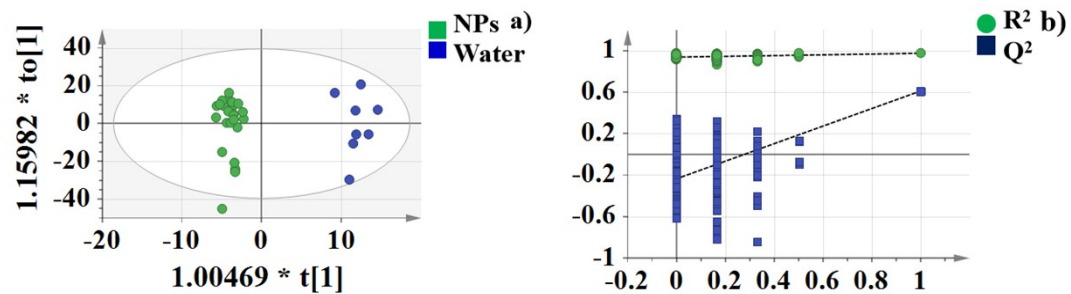


Fig. S8 Statistical analysis of iEESI-MS data of root samples between cultured in water and three NPs (including Ag NPs, Au NPs and CdTe QDs) at $t = 21$ h. (a) Score plots of OPLS-DA, (b) permutations test of OPLS-DA model. (Note: green squares indicate NPs group, blue squares indicate water group)

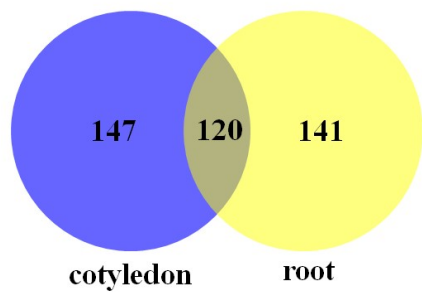


Fig. S9 Venn diagram displays the coverage of differential signals (VIP > 1.0) in molecular analysis of cotyledon samples (purple circle) and root samples (yellow circle) between cultured in water and three NPs (including Ag NPs, Au NPs and CdTe QDs).

Table S1 The variation evaluation on iEESI-MS analysis of mung bean sprouts for seven replicates.

Compounds Ions	Relative Abundance (%)							Average (%)	SD	RSD (%)
<i>m/z</i> 176	10.50 ^a	10.29 ^a	11.19 ^a	10.83 ^a	10.48 ^a	12.07 ^a	11.46 ^a	10.97 ^a	0.64 ^a	5.82 ^a
	11.20 ^b	13.43 ^b	16.33 ^b	9.22 ^b	28.45 ^b	18.28 ^b	14.15 ^b	15.87 ^b	6.31 ^b	39.78 ^b
<i>m/z</i> 219	1.99 ^a	2.10	2.13 ^a	2.23 ^a	2.08 ^a	2.44 ^a	2.28 ^a	2.18 ^a	0.15 ^a	6.81 ^a
	2.17 ^b	1.50 ^b	0.95 ^b	1.05 ^b	1.63 ^b	2.53 ^b	2.26 ^b	1.73 ^b	0.61 ^b	35.37 ^b
<i>m/z</i> 381	24.00 ^a	26.84 ^a	26.11 ^a	27.36 ^a	26.56 ^a	29.92 ^a	27.41 ^a	26.89 ^a	1.77 ^a	6.57 ^a
	25.95 ^b	15.63 ^b	14.29 ^b	17.29 ^b	24.54 ^b	39.34 ^b	26.72 ^b	23.39 ^b	8.70 ^b	37.18 ^b

(Note: ^a Analytical variation, ^b biological variation.)

Table S2. Identification of sugars in mung bean sprouts using HR-MS.

Sugars	Ion Formation	Observed m/z	Theoretical m/z	Delta (ppm)
Glucose	[M + K] ⁺	219.0259	219.0265	3.0
Maltose	[M + K] ⁺	381.0781	381.0794	3.0
	[2M + K] ⁺	723.1935	723.1956	3.0
	[3M + K] ⁺	1065.3087	1065.3118	2.9
Maltotetraose	[M + K] ⁺	705.1843	705.1850	1.0
Maltopentaose	[M + K] ⁺	867.2369	867.2378	1.0
Maltotriose	[2M + K] ⁺	1047.2978	1047.3012	3.0