Supporting information

Title: Dose-dependent effects of CeO_2 nanomaterials on tomato plant chemistry and insect herbivore resistance

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Table S1. Correlation table between root morphology traits and plant (shoot, root and total) biomass. Shown are coefficient of correlations and p values based on Pearson's correlation analyses.

Root morphology traits	Shoot biomass	Root biomass	Total biomass
Root length	r = 0.33, p = 0.160	r = 0.52, p = 0.019	r = 0.44, p = 0.049
Root surface area	r =0.59, p = 0.005	r =0.63, p = 0.003	r =0.69, p < 0.001
Root tips	r = 0.48, p = 0.033	r = 0.39, p = 0.089	r = 0.51, p = 0.019
Root volume	r = 0.73, p < 0.001	r = 0.66, p = 0.002	r = 0.82, p < 0.001

Table S2. Two-way ANOVA table for determining the interactive effects of CeO_2 treatment and herbivore *Helicoverpa armigera* on tomato plant growth, nutrient and chemical defense traits. The results are shown with the test statistic F-value and significance levels ($^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$ and $^{NS}p > 0.05$).

Plant traits	CeO_2 treatment	Herbivore	CeO_2 treatment × Herbivore
Shoot biomass	3.90 *	1.34 NS	0.15 NS
Root biomass	2.24 NS	3.94 NS	0.70 NS
Shoot height	5.64 **	0.31 NS	0.51 NS
Stem thickness	0.67 NS	2.47 NS	0.20 NS
Leaf chlorophyll	7.37 ***	11.21 **	1.87 NS
Root length	2.58 NS	0.57 NS	0.62 NS
Root surface area	5.82 **	1.78 NS	0.39 NS
Root volume	5.87 **	0.65 NS	0.92 NS
Root tips	8.26 ***	9.84 **	2.68 NS
Leaf Ce	3.20 *	7.31 *	0.92 NS
Root Ce	13.78 ***	0.92 NS	0.93 NS
Leaf C	3.97 *	0.04 NS	2.59 NS
Leaf N	3.57 *	17.31 ***	1.90 NS
Leaf Fe	9.21 ***	0.26 NS	8.21 ***
Leaf Mn	3.18 *	0.20 NS	1.54 NS
Leaf Cu	1.94 NS	4.79 *	2.24 NS
Leaf Si	5.46 *	0.11 NS	1.33 NS
Leaf soluble sugars	18.53 ***	3.56 NS	0.07 NS
Leaf amino acids	70.38 ***	2.58 NS	0.11 NS
Leaf total phenolics	11.45 ***	0.24 NS	0.46 NS
Leaf flavonoids	12.63 ***	0.62 NS	0.28 NS

Table S3. Correlation table for assessing the relationship between plant chemical traits and larva weight gain of *Helicoverpa armigera.* Shown are coefficient of correlations and p values based on Pearson's correlation analyses.

Plant chemical traits	**Larva weight gain of *H. armigera***
Leaf Ce	r = 0.17, p = 0.483
Leaf C	r = 0.001, p = 0.997
Leaf N	r = 0.025, p = 0.279
Leaf Fe	r = -0.35, p = 0.127
Leaf Mn	**r = -0.48, p = 0.033**
Leaf Cu	r = -0.28, p = 0.226
Leaf Si	**r = -0.47, p = 0.035**
Leaf soluble sugars	r = 0.10, p = 0.657
Leaf amino acids	r = 0.27, p = 0.238
Leaf phenolics	**r = -0.76, p < 0.001**
Leaf flavonoids	r = -0.07, p = 0.769

Figure S1

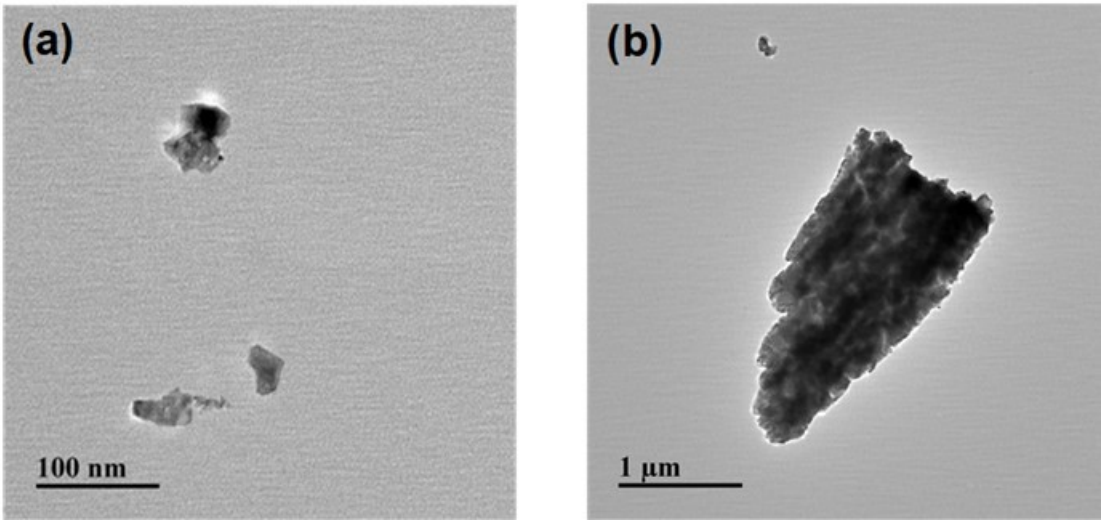

Fig. S1. Characterization of CeO_2 NMs and CeO_2 bulk materials (BMs) suspended in Milli-Q water. TEM images show the size and shape of CeO_2 NMs (a) and CeO_2 BMs (b), respectively.