Electronic Supplementary Material (ESI) for Environmental Science: Nano.

FOURIER TRANSFORM INFRARED SPECTROSCOPY CONTRIBUTION TO DISENTANGLE NANOMATERIAL (DWCNT, TiO_2) IMPACTS ON TOMATO PLANTS

Clarisse Liné[a,b], Juan Reyes-Herrera[c], Mansi Bakshi [a,d], Mohammad Wazne[c], Valentin Costa[a], David Roujol[e], Elisabeth Jamet[e], Hiram Castillo-Michel[c], Emmanuel Flahaut[b] and Camille Larue[a*]

[a]Laboratoire Ecologie Fonctionnelle et Environnement, Université de Toulouse, CNRS, Toulouse, France

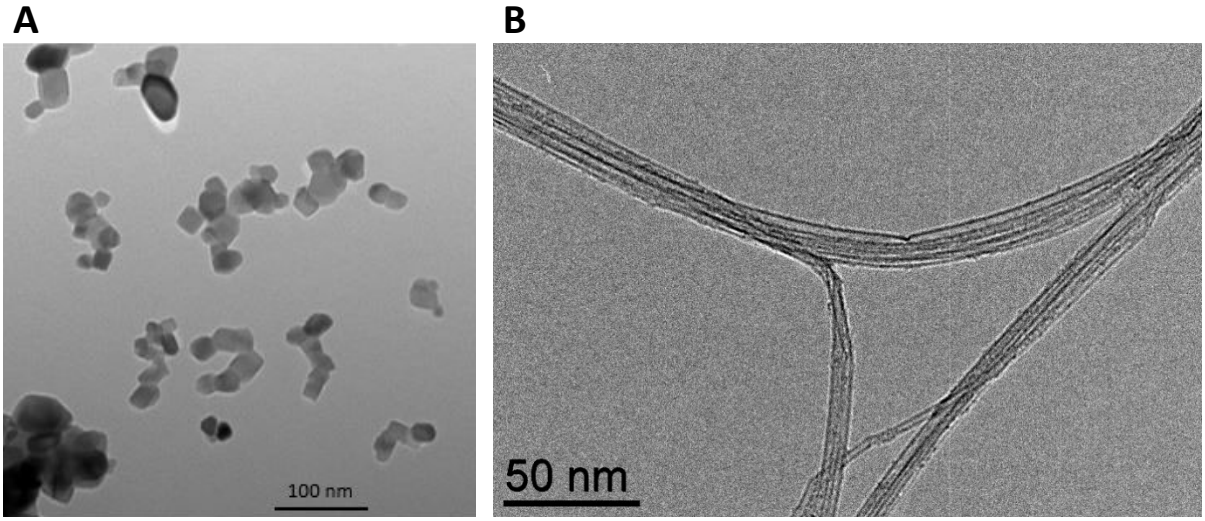
[b]CIRIMAT, Université de Toulouse, CNRS, INPT, UPS, UMR CNRS-UPS-INP N°5085, Université Toulouse 3 Paul Sabatier, Bât. CIRIMAT, 118, route de Narbonne, 31062 Toulouse cedex 9, France [c]Beamline ID21, European Synchrotron Radiation Facility (ESRF), Grenoble, France

[d]Institute of Environment and Sustainable Development, Banaras Hindu University, Varanasi, India

[e]Laboratoire de Recherche en Sciences Végétales, Université de Toulouse, CNRS, UPS, Auzeville-Tolosane, France

Supplementary information

Figure S1. TEM images of TiO_2 NPs[1] (A) and CNTs (B) used in this study.



1. *Vijayaraj, V. et al. Transfer and ecotoxicity of titanium dioxide nanoparticles in the terrestrial and aquatic ecosystems : a microcosm study. Environ. Sci. Technol.* ***52,*** *12757–12764 (2018).*

Figure S2. Morphological parameters : plant height (A), leaf numbers (B), total leaf surface area (C) and total fresh biomass (D) after tomato exposure for 5, 10, 15 or 20 days in a soil contaminated with TiO_2-NPs or CNTs at 100 or 500 $mg.kg^{-1}$ (TiO2 100, TiO2 500, CNT 100, CNT 500) (n=5, mean ± standard deviation). Different letters imply statistical differences ($p<0.05$) within a time exposure condition.

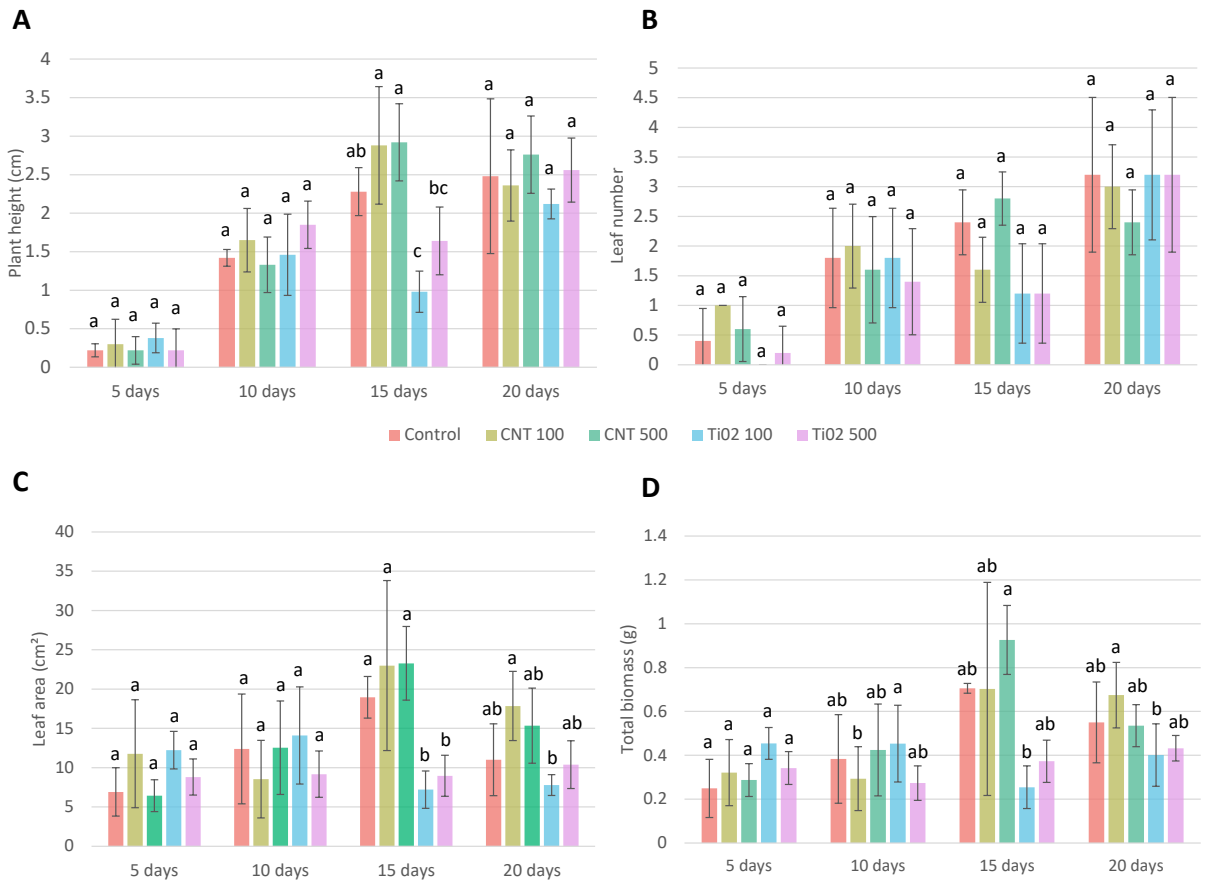


Figure S3. PCA on the morphological parameters assessed (plant height, number of leaves, total leaf area and total biomass) for the four exposure durations (A. 5 days, B. 10 days, C. 15 days and D. 20 days) for tomato exposed in a soil contaminated with CNTs or TiO_2-NPs at 100 or 500 $mg.kg^{-1}$ (Control, CNT 100, CNT 500, TiO_2 100 and TiO_2 500). Bigger symbols are the barycenter of ellipses.

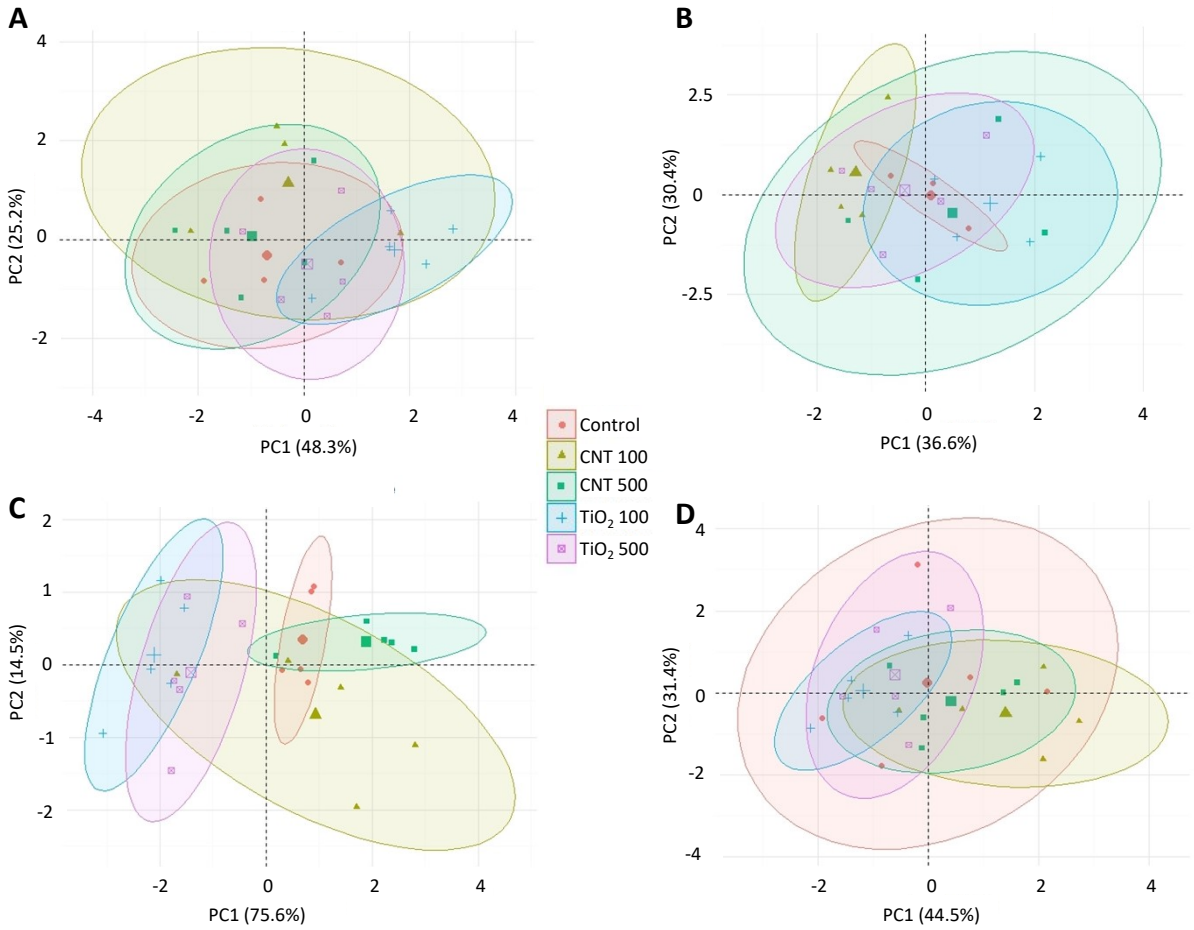


Figure S4. PC-LDA of the FTIR spectra (between 1800-800 and 2900-2700 cm^{-1}) acquired on tomato leaves for the four exposure durations (A. 5 days, B. 10 days, C. 15 days and D. 20 days) for tomato exposed in a soil contaminated with CNTs or TiO_2-NPs at 100 or 500 $mg.kg^{-1}$ (Control, CNT 100, CNT 500, TiO_2 100 and TiO_2 500). PC-LDA were run with Orange software and draw with RStudio (ggplot2).