TiO_2 nanoparticles may lighten cadmium harmfulness in co-treatment experiments on the aquatic fern *Azolla filiculoides*

Monica RUFFINI CASTIGLIONE, Department of Biology, University of Pisa, via Luca Ghini 13, 56126 PISA,

The nanotechnology revolution and its challenges have been going on for some time, accompanied however by ethical/safety implications related to the environment release of new nanomaterials. The effects of nanoparticles (NPs) on ecosystems and biota are indeed not yet fully clear and unambiguously interpretable, especially in a scenario of a co-presence with other contaminants, such as heavy metals.
Previous studies reported an induction of antioxidant response in *Vicia* spp. treated with TiO_2 NPs, suggesting a possible protective action of NPs in plants exposed to abiotic stress. On this basis we aimed to assess if TiO_2 NPs might alleviate Cd injuries and improve the ability of plants to cope with this metal, focusing on the hydrophyte *Azolla filiculoides* as a model system.
After a TiO_2 NPs priming, *A. filiculoides* plants were transferred to Cd contaminated water with or without TiO_2 NPs, for five days. Cadmium uptake, morpho-anatomical and physiological aspects were studied in treated plants. The continuous presence of TiO_2 NPs, though not increasing Cd uptake in comparison with a priming treatment, induced a higher Cd translocation to the aerial portion. Higher cadmium contents in leaves did not induce damages to the photosynthetic machinery, probably thanks to a compartmentalization strategy aimed at confining most of this pollutant to less metabolically active peripheral cells. The permanence of NPs in growth medium ensured a better efficiency of the antioxidant apparatus (proline, glutathione-peroxidase, catalase activities), induced a decrease in H_2O_2 content, however was not able to lower the oxidative damage (in terms of TBARS).