
Studies of palladium uptake by plants – important aspects of experiment design

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An important part of environmental studies is related to the bioavailability of metals, with special attention to the transformation of their nanoparticles. In the environment ionic and metallic forms can often coexist. As part of the conducted studies, we investigated the response of white mustard to the presence of palladium, introduced to the nutrient solution in the form of nanoparticles and salts. One of the tested was $\text{Pd}(\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$, highly soluble in water and already applied in some toxicological studies. To control the process of the conversion of one form into another, we applied three different methods – transmission electron microscopy (TEM), single particles ICP MS and adsorptive stripping voltammetry. Based on the obtained results, it was shown that in the aqueous solution palladium ions concentration decreased just after standard preparation. Analyzes completed by TEM have shown, that nanoparticles with a diameter below 5 nm are formed. These nanoparticles, as well as those around 50 nm, can be taken up by plant. Nanoparticles embedded in plant tissues can subsequently undergo some processes that cause their dissolution. As in the natural environment, metal ions can form complexes with different ligands, such conditions should be simulated in studies concerning metals uptake and its detoxication in plants.

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