

Impact of Nano-Anatase TiO₂ on the Germination Indices and Seedling Growth of Some Plant Species

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Abstract : In this study, the effects of nTiO₂ on seed germination and growth of six plant species (wheat, soybean, tomato, canola, cucumber, and lettuce) were evaluated in petri dish (direct exposure) and in soil in a greenhouse experiment (soil exposure). Data demonstrate that under both culture conditions, low or mild concentrations of nTiO₂ either stimulated or had no effect on seed germination, root growth and vegetative biomass while high concentrations had an inhibitory effect. However, results showed that the impacts of nTiO₂ on plant growth in soil were partially consistent with those observed in pure culture. Based on both experiment sets, among above six species, lettuce and canola were the most susceptible and the most tolerant species to nTiO₂ toxicity. However, results revealed the impacts of nTiO₂ on plant growth in soil were less than petri dish exposure probability due to dilution in soil and complexation/aggregation of nTiO₂ that would lead to lower exposure of plants. The high concentrations of nTiO₂ caused significant reductions in fresh and dry weight of aerial parts and root and chlorophyll and carotenoids contents of all species which also coincided with further accumulation of malondialdehyde (MDA). These findings suggest that decreasing growth might be the result of an nTiO₂-induced oxidative stress and disturbance of photosynthesis systems.

Keywords : chlorophyll, lipid peroxidation, nano TiO₂, seed germination

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