



Effects of cerium oxide nanoparticles on soil enzymatic activities and wheat grass nutrients uptake

Biting Li (1), Yirui Chen (1), Lingyun Bai (1), Astrid Jacobson (2), and Christophe Darnault (1)

(1) Department of Environmental Engineering and Earth Sciences, Clemson University, Clemson, SC, United States (cdarnau@clemson.edu), (2) Department of Plants, Soils & Climate, Utah State University, Logan, UT, United States

The US National Science Foundation estimated that the use of nanomaterials and nanotechnology would reach a global market value of \$1 million this year. Concomitant with the wide applications of nanoparticles is an increasing risk of adverse effects to the environment and human health. As a common nanomaterial used as a fuel catalyst and polish material, cerium (IV) oxide nanoparticles (CeO_2 NP) were tested for their potential impact on soil health and plant growth. Through exposure by air, water, and solid deposition, nanoparticles may accumulate in soils and impact agricultural systems. The objectives of this research were to determine whether CeO_2 NPs affect the growth of wheat grass and selected soil enzyme activities chose as indicators of soil health. Wheat grass was grown in plant boxes containing CeO_2 NPs mixed with agricultural soil at different concentrations. Two control groups were included: one consisting of soil with plants but no CeO_2 NPs, and one containing only soil, i.e. no NP or wheat plants added. The plants were grown for 10 weeks and harvested every two weeks in a laboratory under sodium growth lights. At the end of the each growing period, two weeks, soils were assayed for phosphatase, β -glucosidase, and urease activities, and NPK values. Spectrophotometer analyses were used to assess enzyme activities, and NPK values were tested by Clemson Agricultural Center. Wheat yields were estimated by shoot and root lengths and weights.