Study shows nanoparticles could damage plant life

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A nanoparticle commonly used in industry could have a damaging effect on plant life, according to a report by an environmental scientist at New Jersey Institute of Technology (NJIT).

The report, published in a recent issue of *Toxicology Letters*, shows that nanoparticles of alumina (aluminum oxide) slowed the growth of roots in five species of plants -- corn, cucumber, cabbage, carrot and soybean. Alumina nanoparticles are commonly used in scratch-resistant transparent coatings, sunscreen lotions that provide transparent-UV protection and environmental catalysts that reduce pollution, said Daniel J. Watts, PhD, the lead author of the study.

"Before this study there was an assumption that nanoparticles had no effect on plants," said Watts, executive director of the York Center for Environmental Engineering and Science and Panasonic Chair in Sustainability at NJIT. "This study makes the observation that seedlings can interact with nanoparticles such as alumina, which can have a harmful effect on seedlings and perhaps stunt the growth of plants. "Other nanoparticles included in the study, such as silica, did not show this effect," Watts added. He did the study with Ling Yang, a doctoral student who recently graduated from NJIT.

The authors conducted the study by allowing seeds to germinate on wet filter paper in Petri dishes, after which they added known quantities of nano-sized alumina suspended in water. The control portion of the experiment was treated only with water, and the authors observed the

experiment for seven days. During that time, they measured the differences in the growth of the plants' roots, which were shown to be statistically significant.

"We suppose that the surface characteristics of the nanoparticles played an important role in slowing the growth of the roots," said Watts. "The smaller the particle, the larger is the total amount of surface area per unit weight. So the smaller you make the particles, the larger is the surface area, which we suspect is what contributes to the growth-slowing interaction between the seeds and the nanoparticles. The small size of the nanoparticles may be changed by the nanoparticles aggregating or clumping together."

But what is still not understood, said Watts, is the nature of the interaction between the nanoparticle and the root of the seed. "What is the mechanism of the interaction between the particle and the root? That we don't know as yet," he said.

Nanoparticles can be deposited into air by exhaust systems, chimneys or smoke stacks, said Watts. The particles can also mix with rainwater and snow and gradually work their way into soil. It is difficult to take results from a lab experiment and conclude that is what happens in the real world, said Watts. "But we speculate that air deposits of nanoparticles or water transport of them are ways in which nanoparticles could mix with plant life," he said.

Source: New Jersey Institute of Technology