Impact of Strontium Aluminate Nanoparticles on Xylem Occlusion

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Light-emitting plants (LEPs) offer the opportunity for cheap, carbon negative lighting. $SrAl_2O_4:Eu^{2+},Dy^{3+}$ (strontium aluminate), is the longest lasting, brightest phosphor of its kind. Recent research has evaluated the possibility of using strontium aluminate to create LEPs, but the Al_2O_3 within the particles causes plant death. This may be due to blockage of the xylem, the conductive tissue that transports water and nutrients up from the roots. Stomatal conductance and percent of conductive xylem were analyzed using a t-test for two independent means. Silica-coated strontium aluminate nanoparticles ranging from 1-15 μm were injected and mixed into the soil of Epipremnum aureum and Ficus altissima. Stomatal conductance was measured and adjusted for leaf area, relative humidity, temperature, and atmospheric pressure. After the experimental period, the xylem was stained, and the percent of conductive xylem throughout each plant was measured. When compared to control groups, experimental groups were found to be statistically similar to control groups ($p>.05$). The change in stomatal conductance rates was also found to be statistically insignificant. This indicated the particles had little to no impact on plant physiology. Stem injection and natural plant uptake were both shown to be viable methods for strontium aluminum movement throughout the plants. However, during the coating process, oxidized sodium crystals were created as a by-product. These introduced severe contamination but did not seem to affect plant health. Further research should focus on removing these crystals, as well as testing multiple injections to increase particle density within the plant.

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