Evaluating the Effect of Zinc Oxide Nanoparticle Treatment on Copper Phytoaccumulation in Avena sativa

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Heavy metal pollution, caused by invasive mining and factory waste, harms ecosystems and human health. This study aimed to find a solution to this issue by examining the effectiveness of zinc oxide nanoparticles in enhancing the bioremediation of copper pollution using Avena sativa (oats). Plants were treated with zinc oxide nanoparticle concentrations of 25 mg/L, 50 mg/L, and 100 mg/L in a controlled environment. Growth rates and observable plant health, and were monitored by evaluating a plant's height, number of leaves, and relative color. After the experiment, copper remaining in the soil was extracted to calculate the percentage of metal removed, and the shoots dried to determine the biomass. Results showed the height of the plants was determined to be statistically insignificant using a chi-squared test. The biomass however was found to be inversely proportional and statistically significant to the treatment concentration, disproving the original hypothesis, with the Control group weighing the most and the 100 mg/L group weighing the least. This was likely due to excessive copper absorption in the higher treatment groups, causing oxidative stress. Copper extraction was directly proportional to treatment concentration, with the 100 mg/L group removing the most and the Control group the least. Overall this demonstrates that the treatment improves the efficiency of a plants' ability to extract materials from its environment, but does not impact its overall growth. With further research, treatment enhanced phytoremediation could become an increasingly effective solution to heavy metal pollution.

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