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Impact of industrial heavy metal pollution on chlorophyll content in tropical trees

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This study investigates the impact of heavy metal contamination, specifically cadmium (Cd), chromium (Cr), and lead (Pb), derived from industrial waste, on the chlorophyll content of tropical trees. Essential micronutrients like copper (Cu), zinc (Zn), manganese (Mn), iron (Fe), nickel (Ni), and cobalt (Co) are vital for plant metabolism; however, in excessive amounts, these elements, along with non-essential metals such as Cd, Hg, and Pb, pose a significant toxicity risk. Soil samples were collected and analyzed, revealing concentrations of 15.15±0.57 mg/kg for Cd, 107.44±1.97 mg/kg for Cr, and 15.78±0.62 mg/kg for Pb, confirming heavy metal pollution. The experimental design utilized a controlled approach, with Albizia lebbeck, Senna sophera, and Senna siamea serving as bio indicators. These species were cultivated in both a baseline (non-polluted) and a contaminated (polluted) soil. Chlorophyll extraction followed a standardized acetone-based protocol, with spectrophotometry providing quantifiable measures of chlorophyll A, B, and total concentrations. The findings highlighted a significant reduction in chlorophyll A and B, as well as total chlorophyll content, among trees grown in contaminated soil, with declines of up to 70%, 85%, and 77% in chlorophyll A, B, and total chlorophyll, respectively, for A. lebbeck. Similar reduction trends of 55%, 68% and 49% chlorophyll A, B, and total concentrations were observed for S. sophera, while the chlorophyll A, B, and total concentrations of S. siamea were reduce up to 65%, 80% and 76% respectively. These results revealed the detrimental effects of heavy metal exposure on the photosynthetic efficiency and overall health of tropical trees at an early growth stage, emphasizing the need for mitigating pollution sources and enhancing soil quality to safeguard plant life.

Biography

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