Assessing the Ecotoxicological Impact of Sucralose on Freshwater Phytoplankton Dynamics

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As artificial sweetener consumption rises, environmental contamination by sucralose has become a growing concern due to its persistence in aquatic ecosystems. Previous research has shown that sucralose impacts microbial communities differently depending on the environment, with cyanobacterial respiration increasing in freshwater while diatom respiration declines (Westmoreland, 2024). This study aims to build on these findings by examining the effects of sucralose on the growth of freshwater plankton, specifically Anabaena (cyanobacteria), Synedra (diatom), and a mixed plankton culture. Cultures were exposed to sucralose concentrations of 0, 0.625, 1.25, 2.5, and 5 g/L in either freshwater algal growth medium or distilled water and maintained at 22°C under ~5,300 lumens of light. Growth was assessed over seven days using a colorimeter at 470 nm to measure chlorophyll concentration, with pH and temperature monitored for consistency. SEM analysis revealed that all treatment groups exhibited significantly lower growth than the control, with no overlap in error bars at the seven-day mark. Given that phytoplankton form the base of aquatic food webs, reductions in their growth could disrupt nutrient cycling and energy transfer across ecosystems. These findings raise concerns about potential bioaccumulation and biomagnification, which may have cascading effects on higher trophic levels. Future research should investigate species-specific responses and assess sucralose's broader ecological consequences, such as whether plankton communities can recover from sucralose exposure or how its effects interact with other environmental stressors.

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