A Novel Field-Based Approach to Reducing Harmful Algal Blooms in Freshwater Ecosystems

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The purpose of this research was to engineer and deploy a method and device that could selectively suppress cyanobacteria and cyanotoxins while improving the overall ecosystem and lake health in a Colorado lake affected by a harmful algal bloom. The hypothesis was that if an engineered device that can deploy 3 mL/L of hydrogen peroxide was paired with biochar and deployed into a lake with a harmful algal bloom, it would be effective at destroying and capturing the cyanobacteria cells and improving the overall lake health. The experiment involved splitting a lake with the harmful algal bloom into three sections: control, hydrogen peroxide (3mL/L) and hydrogen peroxide (3mL/L) and biochar. Multiple tests were used to determine if the cyanobacteria levels in the water decreased over 16 days. The data collected did support the original hypothesis. The findings lead to the conclusion that (3mL/L) of hydrogen peroxide, when paired with biochar, was able to decrease a harmful algal bloom by roughly 85%, decrease cyanotoxins, and improve lake health. Statistical analysis suggested that the hydrogen peroxide and biochar section demonstrated a statistically significant decrease in cyanobacteria compared to the control and hydrogen peroxide sections. Additionally, when the hydrogen peroxide and biochar section was compared to the control after 16 days, there was a 78%, 86%, 95%, and 88% decrease in chlorophyll a, phycocyanin, allophycocyanin, and turbidity, respectively. The combination of hydrogen peroxide and biochar created a successful method to mitigate harmful algal blooms in a real-world application. The results were expressed to many groups within the community to promote sustainable water remediation practices.

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