Analysis Tutorial Prospectus

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Title: Effects of hydrogen peroxide (H_2O_2) on the growth of different bloom-forming cyanobacteria

Research question:

i. How does hydrogen peroxide (H_2O_2) affect the growth of different bloom-forming cyanobacterial species?

Objectives:

i. Evaluate the inhibitory effects of hydrogen peroxide on the growth dynamics of various cyanobacterial bloom species.

Approach:

This project will utilize a controlled, laboratory-based experimental design to assess the effects of hydrogen peroxide on harmful cyanobacterial blooms. Representative bloom-forming cyanobacteria, including *Microcystis aeruginosa*, *Planktothrix agardhii*, and *Fischerella* sp., will be cultured at 25 °C under a 12:12 h light:dark cycle with a light intensity of 30 µmol m^{-2} s^{-1} photosynthetically active radiation (Yang et al., 2018). The herbicide PAK 27, a source of hydrogen peroxide, will be applied at environmentally relevant concentrations ranging from low (1–5 mg/L) to high (6–10 mg/L), based on previous studies demonstrating selective suppression of cyanobacteria (Akther & Cutright, 2024).

To visualize treatment effects, data will be analyzed and plotted in R Studio using the **tidyverse, readxl, dplyr,** and **ggplot2** packages. The dataset will be imported from an Excel file using the **read_excel()** function. A multi-panel graph will then be created using **ggplot()**, where cyanobacterial growth over time will be illustrated with points and lines (**geom_point(), geom_line()**), and error bars **(geom_errorbar()**) will indicate standard deviations (Ito and Merphy, 2013). The **facet_grid**() function will be used to generate separate panels for each pigment–phytoplankton combination, enabling clear comparisons across treatment groups (Mirman, 2017; Love et al., 2014). In addition, statistical analyses such as **ANOVA** will be conducted to assess significance of differences in growth among treatments and species (Faraway, 2002).

References

Akther, F., & Cutright, T. J. (2024). Control of Cyanobacterial Algal Blooms and Soluble Reactive Phosphorus Using PAK-27 and Phoslock®. *Water Conservation Science and Engineering*, *9*(2), 66. https://doi.org/10.1007/s41101-024-00302-7

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