Harmful Algal Growth Suppressed by Allelopathy Regardless of Excess Phosphorus

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Harmful algal blooms (HAB) plague eutrophic waters and are often caused by excess anthropogenic nutrients, specifically phosphorus. Allelopathy, a defense mechanism in which an organism excretes harmful chemicals, has been previously identified as a potential biological control method for HABs. The effect of varying nutrient levels on this allelopathy, however, has not been investigated. This study examined whether the allelopathy of the cyanobacterium (Microcystis aeruginosa) towards the green HAB alga (Chlorella) was impacted by varying phosphorus levels. This was tested by measuring the growth rate and final cell density of Chlorella under high or low phosphorus conditions, and one of the allelopathy treatments. The allelopathy treatments were: a negative control, live M. aeruginosa, or M. aeruginosa filtrate. Chlorella growth was significantly inhibited by phosphorus limitation, but further inhibited by the filtrate or live M. aeruginosa, even in the high phosphorus treatment. The results indicated that the effect of the allelopathy was stronger than the high phosphorus treatment and the allelopathy could override the benefit of eutrophic growing conditions. This project demonstrates the effectiveness of allelopathy for HAB suppression in a range of phosphorus conditions, establishing a promising control for limiting the destructive and costly impacts of HABs.

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