Plankton Wars: An Innovative Analysis of Daphnia Genotype Biomanipulation for Algae Bloom Prevention

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Harmful algae blooms plague aquatic ecosystems around the world. They impact water quality and ecosystem diversity, cause dead zones, cost the fishing and tourism industries millions of dollars, and will only be increased by climate change. Furthermore, eradicating the blooms with algaecides expedites hypoxia and dead zones while poisoning aquatic organisms. Therefore, a method to treat and prevent harmful algae blooms is needed. From my past research (2021), Daphnia magna was discovered to be the ideal species of freshwater zooplankton to biomanipulate to treat and prevent algae blooms. However, very little is known about the species' distinct genotypes which could allow for more effective biomanipulation for algae bloom treatment and prevention. In this project, different genotypes of Daphnia magna were compared for algae consumption. The most effective genotype was then tested under different environmental conditions of pond mud (aquatic microbes), nutrient pollution, microplastics, and calcium carbonate to see which factors helped or hindered their success at harmful algae bloom treatment and prevention. Statistical analysis demonstrated that genotype 4 is the ideal genotype of D. magna to biomanipulate to treat and prevent harmful algae blooms, can effectively do this in nutrient and plastic polluted environments, and can have their health and success improved through calcium carbonate and naturally occurring aquatic microbes.

Awards Won:

Fourth Award of $500

China Association for Science and Technology (CAST): Award of $1,200