Designing a Solar Powered Ultrasonic Cyanobacteria Growth Inhibitor

Snyder, Virginia (School: Windsor High School)

Water quality is one of Vermont's largest problems; contaminated water limits the state's drinking water and is detrimental to Vermont's tourism industry. Harmful algal blooms, (HABs) which contain cyanobacteria, a toxic type of algae, are a large cause of this water contamination and cause eutrophication. The engineering goal was to creative a cost effective device that emits ultrasonic frequencies to inhibit growth of cyanobacteria using open source coding and solar power. The first experiment looked for intracellular changes and photosynthetic activity. Four beakers of Anabaena were exposed to the following ultrasound respectively: an ultrasonic rodent repellent, a piezo buzzer device, a ultrasonic sensor device, and a control with no device. Each group was tested every 24 hours to look for changes in the structure of the cells in each filament and amount of oxygen bubbles (signifying photosynthesis). Through the experiment it was found that the only devices that inhibited growth were the open source, engineered devices, not the rodent repellent. The second experiment looked for changes in the amount of chlorophyll. Three groups of seven petri dishes with 10 mL of culture had varying ultrasonic exposure. The first group was the control, the second was the ultrasonic sensor, and the third was the piezo buzzer. Each sample was tested in a spectrometer and then analyzed for absorbency variances at the 430 wavelength. It was found that the only sample that had reduced chlorophyll, was the sample exposed to the piezo buzzer device. Conclusions can be drawn from both experiments that open source technology is successful is reducing photosynthetic activity in cyanobacteria. This technology can now be used to create a marketable device that is affordable for Vermont.

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