

Environ Technol. 2001 Apr;22(4):383-90.

Ultrasonic irradiation for blue-green algae bloom control.

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A novel application of ultrasonic irradiation for rapid control of blue-green algae (BGA) bloom was investigated. Potassium iodide (KI) experiments demonstrated that frequency and input power are the major factors that affect the ultrasonic irradiation intensity. Short exposure (3 s) to ultrasonic irradiation (120 W input power, 28 kHz) effectively settled naturally growing BGA suspension. Electron microscopy reconfirmed that sedimentation was caused by the disruption and collapse of gas vacuoles after ultrasonic exposure. Moreover, even after 5 min of exposure to ultrasonic irradiation (1200 W input power, 28 kHz) the microcystin concentration in BGA suspensions did not increase. For the same input power (120 W), a lower frequency (28 kHz) was found to be more effective in decreasing the photosynthetic activity of BGA than a higher frequency (100 kHz). The sonicated cells did not proliferate when they were cultured in conditions that simulated the bottom of water bodies (i.e. with limited light (400 lx) or no light and non-aerated or aerated (1 l min⁻¹)). Furthermore, ultrasonic irradiation did not only collapse gas vacuoles and precipitate BGA, but may have also inflicted damage on the photosynthetic system of the BGA.