Phototactic Analysis of the Effects of the Chemorepellent Nitrate on Taxis-Based Vertical Column Orientation in Phytoplanktonic Flagellates

Bhushan, Rohan

Nitrate pollution is a major issue around the world, and has contributed to much environmental damage. This experiment aimed to investigate the effects nitrate pollution has on algae's motility to the surface of water, and the influence gravitaxis, phototaxis and chemotaxis has. It was hypothesized that if the algae are exposed to nitrate, the algae will tend to exhibit negative chemotaxis, resulting in increased dependence on organic carbon sources, therefore leading to reduced photosynthetic output. Euglena gracilis and Chlamydomonas were used as model algae to help investigate the various properties of algae, such as cell concentration or size. Tests were analyzed at both surface and depth to compare these values. Tests varied with the addition of Euglena and Chlamydomonas, presence of light, and presence of nitrate. Experimentation found that nitrate impaired gravitaxis in both species of algae, but were able to rely on phototaxis in the presence of light. Nitrate also seemed to be acting as a chemorepellent at the surface of the water, as the algae did not move erratically in the presence of nitrate and light, but rather migrated deeper. In tests exposed to nitrate cell size was significantly lowered, but glucose dependence was increased, inferring that the energy obtained may have been used primarily to migrate to deeper depths. In tests exposed to nitrate cell size was significantly lowered, but glucose dependence was increased, inferring that the energy obtained may have been used primarily to migrate to deeper depths. As the algae continue to migrate deeper due to nitrate pollution, the dependence on organic sources of carbon will increase, resulting in reduced carbon fixation through surface photosynthesis.

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