Create Your Own Algae Bloom

What do we need to make algae grow? How does eutrophication occur?

Students set up algae incubators to research algae blooms.

Materials

- Freshwater sample (from an established water source: pond, lake ditch) Note: Depending on where you are located, there may be no need to add algae
- Cyanobacteria, if no algae present in water sample
- Phosphate fertilizer (such as: Hi-Yield Super Phosphate 0-18-0, or similar)
- Nitrate fertilizer (such as: Hi-yield Nitrate of Soda 16-0-0, or similar)
- All Purpose Plant Food (such as: Miracle Gro 12-4-8)
- Topsoil
- Funnel
- 5-8 Clear containers for incubation of cultures (500 mL water bottles with labels removed) per group
- Light source
- Temperature controlled space

Procedure

1. Test the level of P and N in the water sample collected using aquarium test kits for ammonia, nitrate and phosphate or dip strips; record the amounts in ppm.
2. Test the level of P and N in the topsoil using soil test kit (such as a LaMotte soil analysis kit); record amounts in ppm.
3. Divide students into groups to set up a control and then test one of the following:
   a. P fertilizer at different concentrations as an additive (0, 0.5 ppm, 1 ppm, 3 ppm, 5 ppm)
   b. N fertilizer as an additive (0, 0.5 ppm, 1 ppm, 3 ppm, 5 ppm)
   c. Plant food as an additive (Since plant food has multiple nutrients, determine a concentration for each of the nutrients and test 5 levels (use label directions as one of the concentrations)
   d. Detergent as an additive (*Choose a detergent to determine 5 different concentrations.)
   Each group prepares 5 levels of concentration of their fertilizer
   -calculate the recommended amount of product according to label directions
   -determine the recommended concentration for the 500 mL container
4. Add 15-20 g of topsoil to each of 5, 500 mL bottle (this should be enough to cover the bottom to about 2 cm)
5. Add 400 mL pond water to each bottle (Use Spring water if there is not an established source for water, NOT tap, deionzed or distilled water.)
6. Skip this step if using water from an established pond. Add 1 mL of algae from the sample to each bottle (if not from an established water source)
7. Add the recommended amount of fertilizer to one bottle--label bottle A, create the dilutions/increased concentrations to add to the other bottles, label B-E and keep track of the concentrations.
8. Close the bottles and keep in lighted area

   **Note: To determine washing machine concentrations, a high efficiency washer uses 15-30 gallons of water to wash and rinse clothing; a standard washing machine uses 29-45 gallons. To simulate the concentration, use the label directions, for the size of the washer. Avoid using "pods" due to safety concerns.*
9. ***Optional:*** A second group of bottles could be prepared and kept in a different temperature controlled environment to see the effect of temperature on the growth of algae.
10. Observe algae growth daily. Measure dissolved oxygen (using a ChemMets kit or similar), ammonia, nitrates and phosphates (see steps 1 and 2 above) after 1 week, then again after 2 weeks.

Reflection

1. How might you fix your algae bloom? Prevent it?