

Name: _____

Estimation of Biomass using Phytoplankton

Background: Phytoplankton are an important part of any aquatic ecosystem. These organisms form the base of the food web and so they are referred to as primary producers. All organisms require energy. Energy enters the ecosystem as sunlight and primary producers (phytoplankton) transform it into food through photosynthesis. This food is then passed through the food web, transferring energy and matter from organism to organism. When it rains, water runs off of the land into aquatic ecosystems. The “runoff” often contains extra

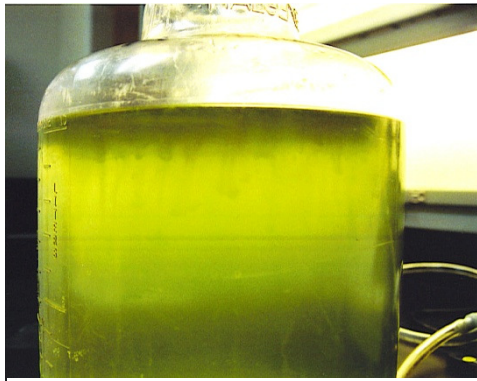


Fig. 1 Water collected during a harmful algal bloom in Delaware’s inland bays.

nutrients like nitrogen from fertilizer used in farming or phosphorus from soap used to wash cars. Phytoplankton can use these nutrients to grow in number and change the stability of the ecosystem. They can go from serving as food for other organisms to forming harmful algal blooms (Fig. 1). When the phytoplankton die, they create zones of “hypoxia”, where the oxygen is too low to support life.

One way to measure the number of phytoplankton in the environment is to estimate the biomass, which is the total mass of the phytoplankton within a given area of the environment. In this activity you will observe how phytoplankton are affected by excess nutrients and light.

Materials:

- Plankton net
- 2-liter bottle or bucket
- 4 test tubes approximately 20-50mL with caps for each group
- 1 roll of foil
- Droppers
- Miracle Grow or other plant food (approximately 2 tablespoons per 500mL)
- Filter paper or coffee filter
- Funnel
- Balance
- Graduated cylinder

Methods:

1. Collect samples using a plankton net.
2. Collect additional water in a bottle or bucket. Filter about 60 mL of the water through a filter into a clean bottle.

3. Label your 4 test tubes:
 - A. +Nutrients and Light
 - B. +Nutrients and Dark
 - C. –Nutrients and Light
 - D. –Nutrients and Dark
4. Place 15mL of the concentrated phytoplankton sample that you collected with the plankton net into each of the 4 test tubes.
5. Add 15mL of filtered water to each test tube.
6. Add 5 drops of Miracle Grow to the two tubes labeled +Nutrient
7. Cover the two tubes labeled dark tightly with foil so no light can get in.
8. Place tubes in a well-lit area with approximately 10-14 hours of light (but be sure they don't get too hot!).
9. At the end of one week, filter each of the tubes onto the filter paper, then dry and weigh the filters.

Analysis: Make a bar graph showing the weight of each filter.

Questions:

1. How were each of the tubes treated differently?
2. Which treatment had the most biomass? Which one had the least biomass? Explain your observations.

3. Was there a difference between biomass for the two light treatments? The two dark treatments?

4. How was **matter**, in the form of nutrients, and **energy**, in the form of sunlight, transformed into biomass in the phytoplankton?

5. How do matter and energy “link” organisms to each other and to their environments?

6. How do humans have an impact on the stability of ecosystems?

Extra Reading:

“Pass the Energy, Please!” by Barbara Shaw McKinney

Online videos

<http://www.youtube.com/watch?v=6d9C6hAKF6I>